The UNESCO Courier

A window open on the world

July-August 1974 (27th year) - 4.80 French francs

6,000,000 more every month

WORLD POPULATION YEAR

Photo © Dan Sicard, Paris

TREASURES
OF
WORLD ART

90 *INDIA*

Heavenly nymph

This countenance of an apsara, or heavenly nymph, is a detail of a sculpture on the façade of Vamana Temple at Khajuraho in Madhya Pradesh, Central India. Vamana is one of a splendid group of Hindu temples built for the Chandel kings of Bundelkhand between 950 and 1050 A.D. and dedicated to Shiva, Vishnu and the Jain patriarchs. Of the 85 original temples, only about 20 survive, richly adorned with graceful sculptures wrought in sandstone. The apsaras carved on Vamana Temple form part of a reconstruction of the heaven of Indra, lord of the Vedic pantheon.

The UNESCO Courier

JULY-AUGUST 1974
27TH YEAR

PUBLISHED IN 15 LANGUAGES

English	Arabic	Hebrew
French	Japanese	Persian
Spanish	Italian	Dutch
Russian	Hindi	Portuguese
German	Tamil	Turkish

Published monthly by UNESCO
The United Nations Educational, Scientific and Cultural Organization
Sales and Distribution Offices
Unesco, Place de Fontenoy, 75700 Paris
Annual subscription rate 24 French francs

★

The **UNESCO COURIER** is published monthly, except in August and September when it is bi-monthly (11 issues a year). For list of distributors see inside back cover.
Individual articles and photographs not copyrighted may be reprinted providing the credit line reads "Reprinted from the **UNESCO COURIER**," plus date of issue, and three voucher copies are sent to the editor. Signed articles reprinted must bear author's name. Non-copyright photos will be supplied on request. Unsolicited manuscripts cannot be returned unless accompanied by an international reply coupon covering postage. Signed articles express the opinions of the authors and do not necessarily represent the opinions of UNESCO or those of the editors of the **UNESCO COURIER.**

The Unesco Courier is produced in microform (microfilm and/or microfiche) by : (1) University Microfilms (Xerox), Ann Arbor, Michigan 48100, U.S.A.; (2) N.C.R. Microcard Edition, Indian Head, Inc., III West 40th Street, New York, U.S.A.; (3) Bell and Howell C°., Old Mansfield Road, Wooster, Ohio 44691, U.S.A.

The Unesco Courier is indexed monthly in the Readers' Guide to Periodical Literature, published by H. W. Wilson Co., New York, and in Current Contents - Education, Philadelphia, U.S.A.

★

Editorial Office
Unesco, Place de Fontenoy, 75700 Paris - France

Editor-in-Chief
Sandy Koffler

Assistant Editor-in-Chief
René Caloz

Assistant to the Editor-in-Chief
Olga Rödel

Managing Editors
English Edition : Ronald Fenton (Paris)
French Edition : Jane Albert Hesse (Paris)
Spanish Edition : Francisco Fernández-Santos (Paris)
Russian Edition : Georgi Stetsenko (Paris)
German Edition : Werner Merkli (Berne)
Arabic Edition : Abdel Moneim El Sawi (Cairo)
Japanese Edition : Kazuo Akao (Tokyo)
Italian Edition : Maria Remiddi (Rome)
Hindi Edition : Ramesh Bakshi (Delhi)
Tamil Edition : N.D. Sundaravadivelu (Madras)
Hebrew Edition : Alexander Peli (Jerusalem)
Persian Edition : Fereydoun Ardalan (Teheran)
Dutch Edition : Paul Morren (Antwerp)
Portuguese Edition : Benedicto Silva (Rio de Janeiro)
Turkish Edition : Mefra Telci (Istanbul)

Assistant Editors
English Edition : Roy Malkin
French Edition : Philippe Ouannès
Spanish Edition : Jorge Enrique Adoum

Illustrations : Anne-Marie Maillard

Research : Christiane Boucher

Layout and Design : Robert Jacquemin

All correspondence should be addressed to the Editor-in-Chief in Paris

N° 7 - 1974 MC 74-3-301

WORLD POPULATION YEAR

Page	
4	**WE THE UNDERSIGNED...** Declaration on food and population
7	**CAN THE EARTH FEED THE GROWING MULTITUDES?** *By Roger Revelle*
13	**A WORLD GONE MAD** It is time to stop squandering nature's resources *By René Dumont*
19	**MAN IS COURTING ECOLOGICAL DISASTER** *By John P. Holdren and Paul R. Ehrlich*
26	**THE HOUR OF DECISION** *By Boris Urlanis*
30	**A COMPUTER WARNING OF HUNGER TOMORROW** *By Mihajlo Mesarovic, Eduard Pestel and Maurice Guernier*
35	**FOUR PAGES IN FULL COLOUR** Population growth and employment
39	**EXODUS TO THE CITY— THE PROBLEM BEGINS WHERE?** *By Ashish Bose*
42	**FALSE PROPHETS OF DOOM** *By Maaza Bekele*
46	**FAMILY PLANNING** A U.N. world survey
49	**ONE NEW TEACHER NEEDED EVERY MINUTE**
50	**165 MILLION CHILDREN WITHOUT SCHOOLS**
52	**FAMILY PLANNING : THE CHINESE EXPERIMENT** *By Han Suyin*
56	**FAMILY PLANNING : THE GHANAIAN EXPERIMENT** *By Robert Plant*
57	**WHY PEOPLE ARE FRIGHTENED OF FAMILY PLANNING** *By Sarah Lukalo*
58	**FAMILY PLANNING : THE INDONESIAN EXPERIMENT** *By Haryono Suyono*
62	**POPULATION POLICY IN LATIN AMERICA**
64	**LET'S SUPPOSE...** A tale for the year 3550 A.D. *By Isaac Asimov*
66	**FROM CONFUCIUS TO MALTHUS** Population questions since antiquity
69	**UNESCO NEWSROOM**
70	**LETTERS TO THE EDITOR**
2	**TREASURES OF WORLD ART** Heavenly nymph (India)

This double issue of the "Unesco Courier" is a follow-up of our May 1974 number and is devoted to the impact of population growth on food, the environment, and social and economic development. Between 19 and 30 August, 1974, the World Population Conference organized by the United Nations will be held in Bucharest (Romania). Leading authorities on demographic problems have prepared various studies for this conference, which was preceded by a series of U.N. symposiums held in Cairo, Honolulu, Stockholm and Amsterdam. Several articles in this issue are based on studies prepared for these meetings. The Editors have also been inspired in the preparation of this number by the considerations on population set forth in a special Unesco study on 12 major world problems of today, to be submitted to Unesco's General Conference next October.

WHE

No link unites the family of man more than his need for food. For food is an essential condition of life, common to all people; wherever they are, whatever they do, they share alike in this need.

The stark truth is that man's ability to produce food is not keeping pace with his need. Despite efforts by governments and the international community to solve world food problems, more people are hungry today than ever before.

Hundreds of millions of the world's people are undernourished. Population growth is adding 75 to 80 million more people each year, 200,000 each day. Within the next 25 years or so our present numbers of nearly 4 billion will be nearly 7 billion.* They must all be fed.

The world food situation took a sharp turn for the worse in 1972 and 1973:

1. Stocks of grain have hit an all-time low since the end of World War II. Surplus stocks formerly held in reserve have nearly been exhausted and no longer offer security against widespread hunger and starvation.

2. Food prices have reached new highs. Last year, despite a record world harvest, escalating demand nearly doubled grain prices. The increasing cost of food threatens to cause serious hardship for many people already spending most of what they have on food.

3. Less of the cheaper protein foods, which normally supplement grain diets, is available. The world's fish catch and per caput production of protein-rich legumes, the staple diet in many countries, have declined.

4. Food shortages have created serious social unrest in many parts of the world and are particularly severe in countries where hunger and the diseases that thrive on under-nourished bodies are prevalent. This scarcity has been aggravated by the consumption of more and more grain to produce meat, eggs and milk.

5. Mounting fertilizer and energy shortages are reducing food production in certain areas and increasing food prices.

In this new and threatening situation, a bad monsoon in Asia (which could occur in any year), or a drought in North America (like those in the 1930's and 1950's), could mean severe malnutrition for hundreds of millions and death for many millions.

We publish here a "Declaration on Food and Population", signed by more than 1,500 prominent citizens of nearly 100 countries, which was presented to the Secretary-General of the United Nations, Kurt Waldheim, on 25 April 1974. The signatories include 16 Nobel Prize-winners as well as distinguished scientists and scholars, artists, statesmen, economists, and government and non-governmental officials.

address this declaration
on food and population
to governments
and men and women everywhere

THE UNDERSIGNED...

This dangerously unstable world food picture, when seen against an unprecedented population increase, has created an immediate sense of urgency. The dangers of food shortages could remain a threat for the rest of this century—even if, hopefully, bumper crops in some years create temporary surpluses and even if the trend toward reduced birth rates becomes general throughout the world.

World food production in the years ahead must rise at least 2 per cent a year to keep pace with the present rate of population growth. But it must rise a good deal more if the world's people are to be provided with an adequate diet. This required annual increase in food production is considerably greater than that which occurred during recent decades—and seems to be increasingly harder to achieve each year. But unless there is this necessary and continuous increase in food production, there will be even more hunger and malnutrition and soaring food prices.

The need to seek solutions is pressing. The nature of the problem, the precarious state of world food production made critical by predicted expectations of continued population growth, calls for concerted action by the world community. There is only one cure for hunger and that is food. No palliatives or panaceas in the form of reports or resolutions can alleviate the pain of empty stomachs that must be filled. International resolutions, however high-minded, are a mockery if they do not have a tangible impact on the human condition.

The United Nations is now providing leadership on both these problems. In August the United Nations will convene the World Population Conference in Bucharest. In November it will convene the World Food Conference in Rome. These are the first occasions when governments have agreed to meet to consider these crucial questions and to consider taking action on them.

With these two conferences only a few months away, we urge governments, acting before, at and after these two global conferences, to consider realistic and purposeful measures such as the following:

1. Give high priority to programmes in each country which will increase the production of grains, legumes and other staple food crops; ensure the availability of protein-rich foods, particularly to the more vulnerable population groups; expand the production of fertilizer; and improve the opportunities for small farmers to make a reasonable living. Develop a comprehensive and constructive World Food Plan for adoption at the World Food Conference.

2. Support sound population policies relevant to national needs which respect national sovereignty and the diversity of social, economic and cultural conditions; accept and assure the human right of each couple to decide for themselves the spacing and size of their families;** and recognize the corresponding responsibility of governments to provide their peoples the information and the means to

* The "Unesco Courier" has adopted the use of billion to mean 1,000 million.
** United Nations Teheran Declaration of Human Rights, 1968.

WE THE UNDERSIGNED...

exercise this right effectively.*** Embody these policies in a World Population Plan of Action to be agreed upon by governments at the World Population Conference.

3. Recognize that the interdependence of the world community creates an obligation to assist in the necessary funding of food and population programmes by both developing and developed countries. This calls for the elaboration and implementation of a global strategy by the United Nations and its family of agencies, including the Food and Agriculture Organization of the United Nations and the United Nations Fund for Population Activities.

4. Establish sufficient food reserves through national and international efforts to provide continuing vital insurance against food shortages.

5. Recognize that, in our finite world where resources are limited, the family of man must one day, and hopefully fairly soon, bring birth-rates into reasonable balance with the lowered death-rates that have been achieved. Many governments see the need to guide national policy toward this objective.

*** Resolution 1672 of the United Nations Economic and Social Council, 1969.

A solution to the present world food crisis must be found within the next few years. The social transformation which can lead to a reduction in the world rate of fertility, along with lowering the rate of mortality, will take decades to accomplish. But a start must be made now because the millions of people being born each year place a heavy burden on the resources available to many nations for education, health, employment and the maintenance of environmental quality.

A reduction in population growth could help alleviate this burden. Effective measures toward resolving both the world food and population problems must come within a total strategy of development. Not only is social and economic development desirable in itself, but also it contributes to moderating population growth. All these measures are designed to improve the quality of life.

In this Declaration, we focus on food because it is the most critical of the pressures on the world today. It is the greatest manifestation of world poverty, which has many aspects. The absolute numbers of desperately poor are far greater today than ever before in history. The need to eradicate acute poverty is being recognized more than ever as a collective responsibility. It is a task which global partnership and the demands of social justice make imperative.

We repeat, food is crucial because literally tens of millions of lives are suspended in the delicate balance between world population and world food supplies. Growing populations, denied sufficient food needed for survival, resist all efforts to secure a peaceful world. With increased production and more equitable distribution of food, the future could provide a prospect of less misery and more hope for countless people now deprived of the basic necessities that are their right.

The World Food Conference represents a unique opportunity. This opportunity must not be missed. Comprehensive international agreements must be reached to assure at least minimal food supplies, with sufficient annual carry-over stocks. Disastrous breakdowns in the world food supply can thus be avoided. All nations may then rest secure in the knowledge thas this, the most critical of their immediate problems, is being attacked with wisdom, vigour and unity of purpose.

In the name of humanity we call upon all governments and peoples everywhere, rich and poor, regardless of political and social systems, to act—to act together—and to act in time. ■

Here is the biggest challenge
facing mankind in our time

CAN THE EARTH FEED THE GROWING MULTITUDES?

by
Roger Revelle

Unesco Courier design by Keith Paul
Photo Al Cooper, Omicron Graphics, U.K.

Photo © Jean Pottier, Courbevoie, France

HUMAN beings use both water and land for food production; that is, the transformation of matter and energy—principally solar energy—into a form that can be utilized for the growth and replacement of human tissue and to supply energy for human metabolism. With a high level of agricultural technology, such as that applied to corn growing in Iowa, this process is about 0.4 per cent efficient. In other words, the food energy contained in the portion of the crop edible by humans is about 0.4 per cent of the solar energy received on the planted area in the growing season.

A nearly minimum subsistence diet for human beings averages about 2,500 kilocalories per person per day (a kilocalorie being the amount of heat required to raise the temperature of one kilogramme of water one degree centigrade).* From the amount of solar energy received by an Iowa cornfield, it can be calculated that the food energy required by 24 human beings can be provided from one hectare at the level of agricultural technology employed in that region.

To provide an adequate diet, including high quality protein and protective foods such as fruit and vegetables, the equivalent of 4,000 to 5,000 kilocalories per person is desirable. At the Iowa level of technology, therefore, every hectare of land might be expected to sustain, in principle, 12 to 15 persons on an adequate diet. These figures are for a typical human, an average for men, women and children.

In the world as a whole at the present time, there is one hectare of farm land for every 2.5 living persons, or nearly ten times the hypothetical minimum required for a subsistence diet. Several reasons explain this apparent excess. Allowing for fallow periods, the land actually harvested during any particular year is only about a half to two-thirds the total cultivated area. About ten per cent is devoted to non-food crops such as cotton, tobacco, rubber, coffee, tea, jute, etc.

Another large fraction is needed to produce food for livestock, which from our standpoint are only 10 to 15 per cent efficient; that is, they use seven to ten times as much food energy as the energy contained in their edible products. Also, from 10 to 20 per cent of food crops are destroyed by pests.

The principal cause, however, is the low level of agricultural technology in most parts of the world. Instead of the 6.4 metric tons grown on a hectare in Iowa, the average Indian or Pakistani farmer produces only a little more than one ton of wheat or rice.

Large parts of the earth's surface are not now cultivated. The land surface of the earth outside the ice-covered areas of Antarctica and Greenland contains about 13 billion hectares. Climatic and other conditions limit the potentially arable land to 2.9 billion hectares, or 22 per cent of the land surface of the earth, but this is still more than twice the present cultivated area, and more than three times the area actually harvested in any year.

---

* *The prefix* kilo *is commonly omitted from the term* kilocalorie, *and the "calories" counted by dieters are in fact kilocalories.*

ROGER REVELLE *is professor of Population Policy and director of the Center for Population Studies at Harvard University, U.S.A. He is president of the American Association for the Advancement of Science and a member of the U.S. National Academy of Sciences. He has long been interested in problems of world population, food supply, and development of natural resources.*

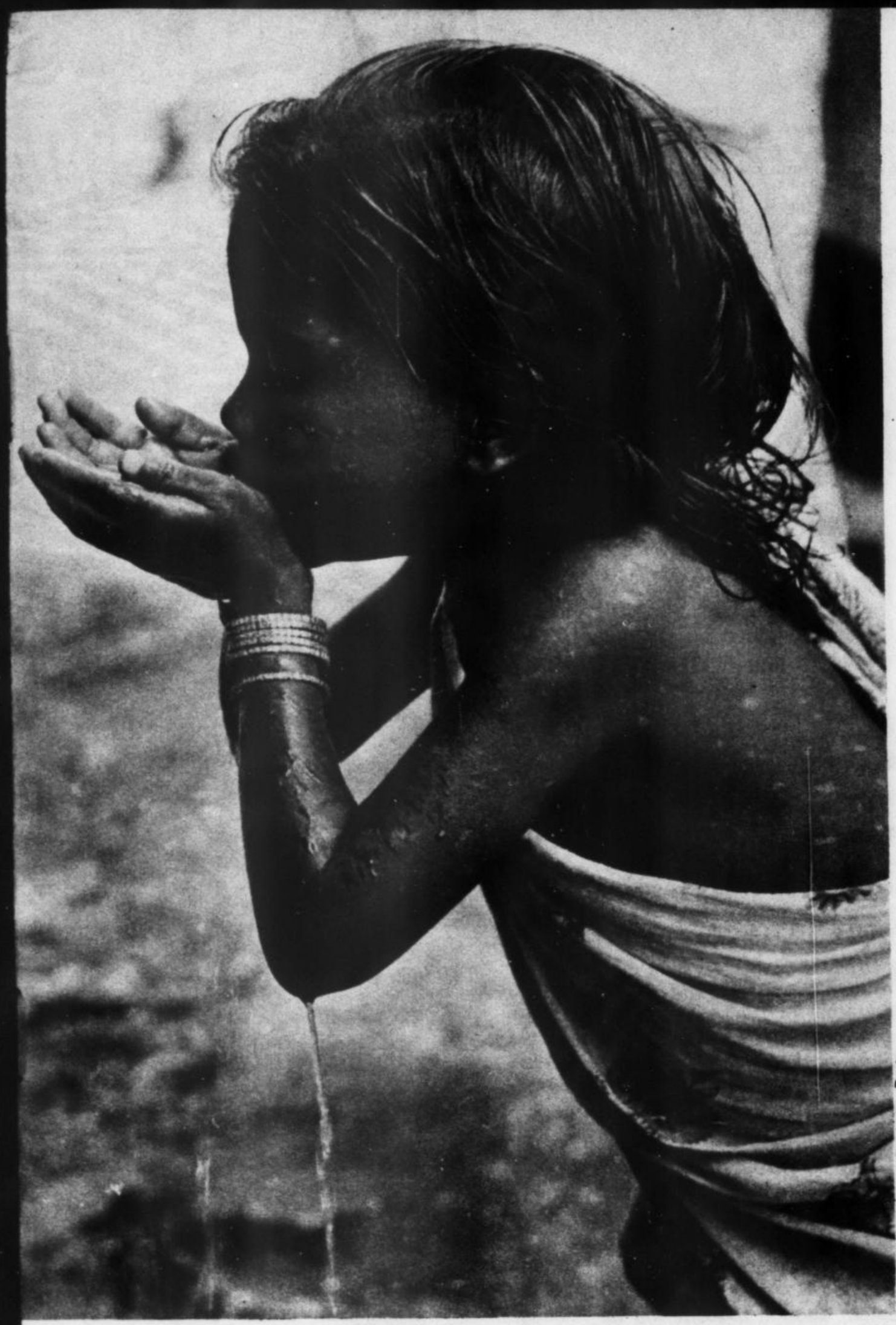


Photo © Dominique Darbois, Paris

Without irrigation, three crops, in principle, could be grown each year in the humid tropics, and two crops in sub-humid regions. Elsewhere only one crop can be grown without irrigation. In all, the potential gross cropped area per year (the cultivated area times the number of crops), without irrigation, is 4.5 billion hectares. With irrigation, the gross cropped area could be considerably expanded.

At present, irrigation takes little of the available supply. Less than four per cent of the total river flow in fact is used, to irrigate about one per cent of the land area of the earth. Most river waters flow to the sea almost unused by man, and more than half the water evaporating from the continents plays little part in human life.

The potential for irrigation is thus very large, but it is limited by the uneven distribution of river runoff between the different regions. About a third of the total comes from South America with less than 15 per cent of the earth's land, while Africa, which contains 23 per cent of the land, yields only 12 per cent of the runoff. Runoff from south-west Asia, North Africa, Mexico, the south-western United States, temperate South America and Australia is less than five per cent of the total, yet these regions contain 25 per cent of the land area. As a result, only 30 per cent of the potential can actually be irrigated, or about 1.1 billion hectares. This would raise the potential gross cropped area to 5.6 billion hectares.

If all this land were cultivated, how many people could the earth feed?

About 10 per cent of the gross cropped area would still be needed to grow non-food crops. With appropriate technology and inputs of production equivalent to those used in Iowa (irrigation water, fertilizer, high-yielding seeds, plant protection, farm tools, farm machinery and scientific farm practices), it can be simply calculated that the remaining hectares could provide a minimum subsistence diet of 2,500 kilocalories a day for 100 billion people. That is after allowing 10 per cent for unavoidable losses and another three per cent for seed. To provide an adequate diet equivalent to 4,000 to 5,000 kilocalories, the potential gross cropped area would be sufficient for 50 to 60 billion people, or about 15 times the present human population of the earth.

Setting aside the question of whether such a large population would be desirable or even possible from other points of view, we may ask what the obstacles are to such an expansion of the earth's cultivated area. These are of several kinds.

Firstly, some 1.5 billion hectares of the potential gross cropped area lie in regions where rainfall is more or less continuous throughout the year —the humid tropics. No technology exists today for intensive cultivation of these lands for food production. With few exceptions, farmers must still practise the ancient technique of "slash and burn" agriculture.

The available evidence, however, supports the belief that with appropriate technology the humid tropics could have a tremendous potential for food production. In the Congo (as it then was), an oil palm was developed which when properly grown yielded about 4,000 kilogrammes per hectare, whereas the ordinary palm yielded about 500 kilos. In the Amazon Valley peppers have been grown successfully by Japanese immigrants for at least 20 years.

Secondly, much potentially arable land is of poor quality. The savannas ▶

Right, the geometry of farming. The extraordinary pattern of fields seen here is formed by different crops grown in narrow strips so as to check wind or water erosion. Wider use of such techniques would enable millions of hectares of the world's wasted land to be used for growing food. Bottom of page, where every morsel counts—an Asian woman receives a carefully-weighed-out ration of oil cake to feed her livestock.

of South America, and the broad belt that extends across Africa just south of the Sahara, contain large areas of some of the most severely weathered and leached soils in the world. Their meagre supply of nutrients is barely enough to support cropping for two to four years, after which six to 12 years or more of fallow are needed.

On the other hand, many of these soils are permeable to both air and water, easily penetrated by roots to great depth, easy to keep in good tilth and have at least moderate water holding capacity. With adequate irrigation, chemical fertilizers and soil conditioners, they could be made highly productive of a wide variety of food crops.

Thirdly, large capital investment is required. Any major extension of the earth's cultivated area, even for subsistence farming, would require a huge capital input, of the order of $500 to $1,000 per hectare. The cost of putting all the potentially arable land outside the humid tropics into cultivation would thus be 500 to 1,000 billion dollars. The latter figure is about equal to the annual gross national product of the United States and twice that of all the less developed countries combined.

Finally, population and potentially arable land are unevenly distributed. Most of the uncultivated but arable land outside the humid tropics is in the more sparsely populated continents. In Europe, 88 per cent of the potential is already cultivated, in North America 53 per cent and in the U.S.S.R. 66 per cent. In Asia the figure is close to 100 per cent. On the other hand, only 16 per cent is as yet under the plough in thinly populated Australia and New Zealand, 21 per cent in South America and 32 per cent in Africa.

These are the lands designated by the U.N. Food and Agriculture Organization (FAO) as "arable land and land under permanent crops... including land under crops, temporary fallow, temporary meadows for mowing and pastures, market and kitchen gardens, fruit trees, vines, shrubs and rubber plantations".

If one sets the areas cultivated against the number of mouths to feed, these disparities take on a grim significance. In Australia and New Zealand, 1.4 hectares are farmed for every person; in Asia, only 0.3 of a hectare. In between come the U.S.S.R. with one hectare per person, North and South America with 0.9 and 0.4, respectively, Africa with 0.5 and Europe with 0.3. That is the position today, or rather in 1965. Twenty years later, anticipated population growth will have reduced the cultivated area per person in Asia to 0.2 of a hectare, *even if every potential square inch is cropped*. And the population will still be growing.

This anticipated squeeze in Asia reflects the heavy population density of a continent containing more than half the world's people and the already high percentage of the land under crops. If the Asian peoples are to obtain enough food, it will be necessary therefore to increase yields and wherever possible to grow two or three crops per year on each cultivated hectare, a development that will entail extensive irrigation. In Europe, too, the spare land is not there to counter the projected population increase, but here demographic growth is relatively low and the population in any event is less than a quarter of Asia's.

In other regions, the mobilization of unused land could more than offset population growth over the 20 year period. Australia and New Zealand, for example, could have 4.8 hectares per person cultivated by 1985 if all available land was put to use. Africa could have one hectare, North America 1.4 hectares, South America 0.9 hectares, and the U.S.S.R. 1.2 hectares. These figures allow for projected population growth and do not include the humid tropics, but again, it should be remembered, the population will not stop expanding in 1985.

The largest areas of potentially arable land are in Africa and South America. Outside the humid tropics, 630 million hectares with adequate water remain uncultivated in these continents. The limiting factors are not natural resources but economic, institutional and social-political problems. In addition, over 300 million potentially arable but as yet uncultivated hectares exist in North America and Australia.

Higher technology depends on the ability of the farmers and the food industry to purchase many "inputs" or factors of production from outside the farm. At the Iowa level of technology, energy must be used from fossil fuels equal to about three-quarters of the food energy in the crops, about half of this energy consumption being represented by irrigation water and chemical fertilizers. At present, the less developed countries use, for

Photo Georg Gerster © Rapho, Paris

Photo © Meter Bedi, Bombay

all purposes, an average of about 400 kilogrammes of coal equivalent per person per year, corresponding to an annual use of three million kilocalories per person.

We have already seen that the average human requires the equivalent of 4,000 to 5,000 kilocalories a day for adequate nourishment. Hence, to meet his dietary needs adequately with high agricultural technology, a citizen in a less developed country would need to use for food production about a third of all the energy now available to him. The average person in developed countries already uses 14 times the fossil fuel energy required to meet his agricultural needs.

For the next 20 to 30 years, a combined three-pronged strategy for the less developed countries of increasing multiple cropping, total cultivated areas and yields from each crop, has been proposed by the FAO. It is estimated that with a total expenditure of 48 billion (1970) dollars, the gross value of crop production could be increased overall by 124 per cent between 1962 and 1985 in four developing regions: Africa south of the Sahara, the Near East and north-west Africa, Asia and the Far East, and Latin America.

The People's Republic of China and other centrally planned economies were omitted from the FAO study, but even so it covered 44 per cent of the world's 1962 population. This population was estimated to rise by 80 per cent through the plan period. Thus the projected increase in food production could forge well ahead of population growth during the 20 years.

During the first eight years of the FAO plan period, between 1963 and 1971, total production of wheat, rice and maize in Asia, including the People's Republic of China, and Latin America did indeed increase at an annual rate of 3.5 per cent, or exactly the rate projected by the FAO for the 23 year period 1962 to 1985. (The figures for Africa are incomplete). The corresponding annual rate of population growth in these regions was 2.25 per cent.

The per capita increase in cereal production in Asia and Latin America worked out at 15 per cent between 1963 and 1971. Thus, average diets in those countries, although they are still close to subsistence level, are slowly improving.

In the final analysis, we must recognize that not all land and water available for human use can be allocated to agriculture. Cities and their industries are also consumers of water. In India, for example, the Irrigation Commission estimates that 17 per cent of the usable water will be needed for industrial and municipal use. The Commission's estimate of a total water use of 616 billion cubic metres for irrigating some 80 million gross cropped hectares is probably low and there may ultimately be a ▶

All over Africa the rising generation is learning to make fuller use of the rich resources of the continent. This boy has been taught the new skills of farming in his school-club as part of a swamp rice improvement project launched in 17 Liberian villages by the U.N. Food and Agriculture Organization.

Photo FAO, Rome

serious conflict for water between agricultural and industrial and municipal users.

To give another example, an intrinsic feature of the Aswan High Dam is that the water can be used for another principal purpose beside irrigation—hydro-electric power. For electric energy to be used effectively for industrial production, it must be generated at a fairly steady rate throughout the year. In contrast, agricultural needs for water vary widely from one season to another. Hence, if water is released from the Dam in such a way as to provide optimum economic benefits for agriculture, the large fluctuations would be far from optimum for industry. On the other hand, if the water is released in accordance with industrial demand, there would be too much for agriculture in winter and not enough in summer.

In this case, the Dam appears to be well adapted to satisfy a relatively high proportion of both needs. In Lower Egypt, there is an enormous reservoir of fresh underground water, equal in volume to several years flow of the Nile. Some part of this great underground store could be used for irrigation to supplement the water coming from Lake Nasser.

Conflicts in land use must also be taken into account. In regions of traditional nomad grazing such as the northwest frontier of Pakistan and the sub-Saharan savanna belt of Africa, establishment of modern high-intensity agriculture encounters serious difficulties, both from the cultural patterns of the people and the conflicting needs of cattlemen and farmers.

Timber industries and agriculture also conflict in ways that may have serious economic consequences. A large fraction of present uncultivated land is now covered by forests, the clearing of which for low-yielding subsistence agriculture may represent a serious economic loss.

Many major irrigation projects, again, involve the construction of large dams and reservoirs, which often flood valuable lands with a high actual and potential agricultural value, apart from creating grave problems of resettling the agricultural peoples displaced.

The growth of cities also commonly utilizes prime agricultural land. Fortunately, the total area of cities is usually under five per cent of the land area of even a highly urbanized country.

Finally, the social consequences of an agricultural revolution cannot be ignored. National farm prices generally will almost certainly fall because of greatly expanded production in the regions in which the new technology has been successfully applied. The farmers in other regions may then be unable to obtain prices sufficient to pay for the water, chemical fertilizers and other inputs needed for high-productivity agriculture. In these circumstances, they could be forced back on subsistence farming, but this would be insufficient to provide for the growing populations of their own villages.

If that happens, large numbers of unskilled countrymen will migrate either to the towns or to the more favoured agricultural regions, where most of them will become landless labourers. Already, there is mass unemployment in the towns and no developing country has solved the problem of raising employment in the industrial sector as fast as the growing labour force. The challenge to policy-makers, either to develop new agricultural technologies for non-irrigated land, or to provide employment and a new way of life for these people, will have to be faced. ■

Roger Revelle

Photo © Jean Pottier, Courbevoie, France

A WORLD GONE MAD

by René Dumont

It is time to stop squandering nature's resources

RENE DUMONT *is internationally known for his hard-hitting studies on the plight of rural populations in developing countries and what he considers the chaos of the world's economic, social and agricultural situations. An agronomist by profession, he is professor of agriculture at the National Institute of Agronomy in Paris. His books have appeared in many languages. "False Start in Africa" and "The Hungry Future" are published by Praeger, New York. His latest book, "L'Utopie ou la Mort" (Utopia or Death), published last year in French and Greek, will shortly appear in English. In May 1974, René Dumont was a candidate for the French presidency, and based his electoral campaign on the ecological issue.*

TENS of millions of children in the poorer countries are being deprived of normal brain development as a result of a serious lack of essential proteins in their diet. This is perhaps the most heart-rending crime of our time, though it may not be the most spectacular or the best known. If present inequalities in food distribution continue, untold millions of children will suffer cerebral underdevelopment in the decades ahead.

Those who for a long time have opposed any kind of contraception, and who still reject certain forms such as abortions in the early stages of pregnancy, unwittingly bear a large share of responsibility for this intolerable situation. But they are not alone. The blame must be shared by all who help to perpetuate an increasingly inadmissible social situation.

The tragedy is that there would be more than enough protein sources in the world to satisfy the minimum needs of all today's children if these substances were distributed rationally and equally. What happens is that they are shared out almost solely in proportion to financial resources, and this leads to appalling waste.

Powdered milk, for example, is one of the best sources of protein, but much of it goes to animals. Over 30 per cent of the world fish catch is transformed into flour—and the percentage is rising—and most of it is used for animal fodder. A good milk cow consumes six grammes of vegetable protein for every gramme of milk protein it produces. The wastage is even higher for beef cattle.

Thus, like mineral and petroleum reserves, which are also limited, the semi-rare protein resources of the world are being woefully squandered

by wealthy countries at the expense of poor ones.

If proteins were distributed more fairly there would be enough to go round, but this would mean a certain amount of austerity in the eating habits of the rich, which in turn would presuppose a social revolution patterned to some degree on that of China.

A Food and Agriculture Organization nutrition expert has shown that if we tried to combat undernourishment simply by increasing production without altering distribution, we should have to increase the food production of the so-called developing countries sixfold between 1970 and the year 2000, a task which is obviously impossible.

The first conclusion to be drawn is this: if we really wish to overcome malnutrition, it is absolutely essential to improve food distribution by making it no longer depend on the buying power of the individual. It has been calculated that present world food production would only satisfy—or should we say gorge—a billion persons if they were all to eat as much as most people in the United States do. And the world's population is almost four billion already! Current industrial output, moreover, could only satisfy 600 million such avid consumers.

Photo Doisneau © Rapho, Paris

Our world has gone mad. It has lost all control, both over its population growth and its production techniques. In some places people are overworked, while more and more young people in the Third World are unemployed. Above all there is the unbridled rise of the consumer society, most blatantly exemplified by the cult of the private motor car.

Attempts to boost food production alone are therefore not enough, though they remain none the less an absolute must. This, of course, is the specific task of agronomists like myself.

When the FAO completed its Indicative World Plan in 1969-1970, it estimated that the "backward" countries would have to achieve an agricultural growth rate of 3.8 per cent per year in order to eliminate most of their malnutrition by 1985, the end of the period under consideration.

Twelve years have now gone by since the beginning of the base year, 1962, and in those twelve years these countries have fallen further behind. Although it is difficult to make a precise assessment, it seems more than likely that the poor countries are, on average, as undernourished as they were before the Second World War.

It even seems quite probable that the poorer classes in India, Bangladesh and most of the Andean mountain regions are less well nourished than they were in the eighteenth century, periods of famine apart.

In 1970, which marked the beginning of the Second Development Decade, it was foreseen that an annual growth rate of 4 per cent in food production would be necessary in order to make up for the accumulated deficit. But at the end of November 1972, Mr. A. H. Boerma, Director-General of FAO, pointed out that in the first two years of the decade the increase in food production had barely exceeded 1 per cent a year whereas population in the countries concerned had increased by over 2.5 per cent.

Unless an extraordinary effort was made, he concluded, unless a miracle took place, the Second Development Decade was already doomed to fail in agriculture. Miracles, alas, are not the agronomist's speciality; he is much too realistic and down to earth to envisage such possibilities.

He can only issue a serious warning to any demographers who still think it impossible to bring about a rapid reduction in population growth and who consider the ageing of society more ominous than over-population. He may also address a timely word to governments responsible for civic education, a tool of which far more use could be made.

If the experts are unable to work out a co-ordinated programme designed to halt population increase, then we face the prospect of a series of catastrophes, whose precise nature no one can predict at this stage. Everyone has a responsibility in this matter.

The Green Revolution, it is true, gave promise of miracles, and it would be wrong to underestimate its achievements. New tropical cereal seeds, including wheat, rice and maize, now have a potential comparable to those of their counterparts in the temperate zones—a dramatic change from the situation twenty years ago.

From Mexico to Pakistan and north-west India, the so-called Mexican wheat, cultivated in irrigated fields, often on a large scale, by farmers who have financial backing and new techniques at their disposal, has been a great success. In India alone wheat production jumped from 12 to 26 million tons in a six-year period.

The picture is more mixed in the rice fields. In the Philippines the rate of growth of the new miracle rice is still erratic. In Java, Sri Lanka (Ceylon), Bangladesh and India the yields of the seeds developed at the International Rice Research Institute at Los Baños (Philippines) have so far been extremely disappointing.

Too many rice fields in these countries are still only rain-fed, unlevelled and dependent on the irregularities of the monsoon. When the government builds an irrigation network, it sometimes leaves the farmers to install the final channels to connect their land to the water mains, and this they usually fail to do.

In Sri Lanka, on the other hand, ▶

"Every car you buy—usually long before you have worn out the one you've got—means that farmers in the tropics will have so much less steel for the ploughs they desperately need to lighten their burden and increase their productivity".

René DUMONT
L'Utopie ou la Mort (Utopia or death)

irrigation water is provided free of charge, or virtually so, and hence it is distressingly wasted. Each hectare receives three or four times as much water as it needs, and this means that three or four fewer harvests are being irrigated. Employment is consequently on the down grade.

The existence of 800,000 unemployed in this little country caused its young "intellectuals" to revolt. In point of fact, they are more interested in a steady office job than standing barefoot in the mud of the rice paddies, like their Chinese counterparts.

In Bangladesh only 320,000 hectares, out of a total of nine million under cultivation, are irrigated in the dry season, yet this is the most favourable period for watering. If all the pumps and tubed wells that are available were fully used, it would be possible to irrigate three times as much land, but these facilities are rented to farmers for a tenth of their cost and only a third of their capacity is used. To cap all, a number of them are completely out of order and those in charge of them have little incentive to repair them, since they know that they will receive their wages in any event.

There are also 250,000 hectares of ponds and reservoirs in Bangladesh, but three-quarters of their area—190,000 hectares—have gradually become choked with earth. If they were excavated to an average depth of two metres or more, 4,000 million cubic metres of food-producing water would immediately collect, since these pools could be stocked with fish or used as irrigation reservoirs.

This project would provide 2,000 million man-days, or in other words, 100 extra days of work over a period of five years for four million landless men—who at present are unemployed for just such a period every year.

The increase in the irrigation potential thus achieved would then bring about full employment—provided, of course, that the population explosion was halted. The cost could easily be met by levying a property tax on the rice fields and on disused reservoirs, and allowing for a moderate rate of inflation (as in Germany in 1933).

A report by the World Bank, however, states that "reasonable expectations" for Bangladesh are a population that will amount to 140-170 million inhabitants by the year 2000, with "a total percentage of rural unemployment remaining constant at 30 per cent, in the 30 years between 1970 and 2000." The report takes no account of the possible mobilization of the labour of the rural population, and all the extensions to the irrigation system it foresees will be provided by external aid. Similarly, increased output will be the result of using chemical fertilizers and insecticides, with little effort being made to utilize organic fertilizers and other means.

As early as 1960 a vast co-operative experiment was made in Bangladesh—then East Pakistan—by grouping small farmers who owned at least one acre of land into village co-operatives where they could deposit their savings, borrow money and find an organized community framework.

A meeting was held each week at which everyone deposited a quarter of a rupee—about $0.13 at the current official rate of exchange—in his savings account, listened to the advice which the "model-farmer" of the village had obtained from the technicians of the district, etc. Substantial loans were soon granted to try to spread the Green Revolution more quickly.

But repayment began to lag in 1967 and a number of village co-operatives are now in a state of actual or virtual bankruptcy. The production of IR 8 rice and vegetables has considerably increased, but most of the farmers even in the vicinity of Comilla, which was the hub of this experiment and gave it its name, were still in debt to private money-lenders when I visited them in January 1973.

The landless 20 per cent of the population and the 25 per cent who own less than one acre are not admitted to the co-operatives and are sometimes excluded from other advantages. Tenant farmers are still obliged to turn over half of the harvest to a landowner who usually does not contribute to cultivation costs. Landless persons can find work as hired hands for only eight months a year; during the other four, they say, "we eat one meal a day instead of three."

How is it possible to turn the unemployment of this half of the population to account so long as most of their earnings continue to go to the landowners, the money-lenders and tradesmen? Women are traditionally confined to the house and its precincts because they would be disgraced if they went out to the fields, yet in China, Vietnam and India, women take part in replanting, weeding and harvesting.

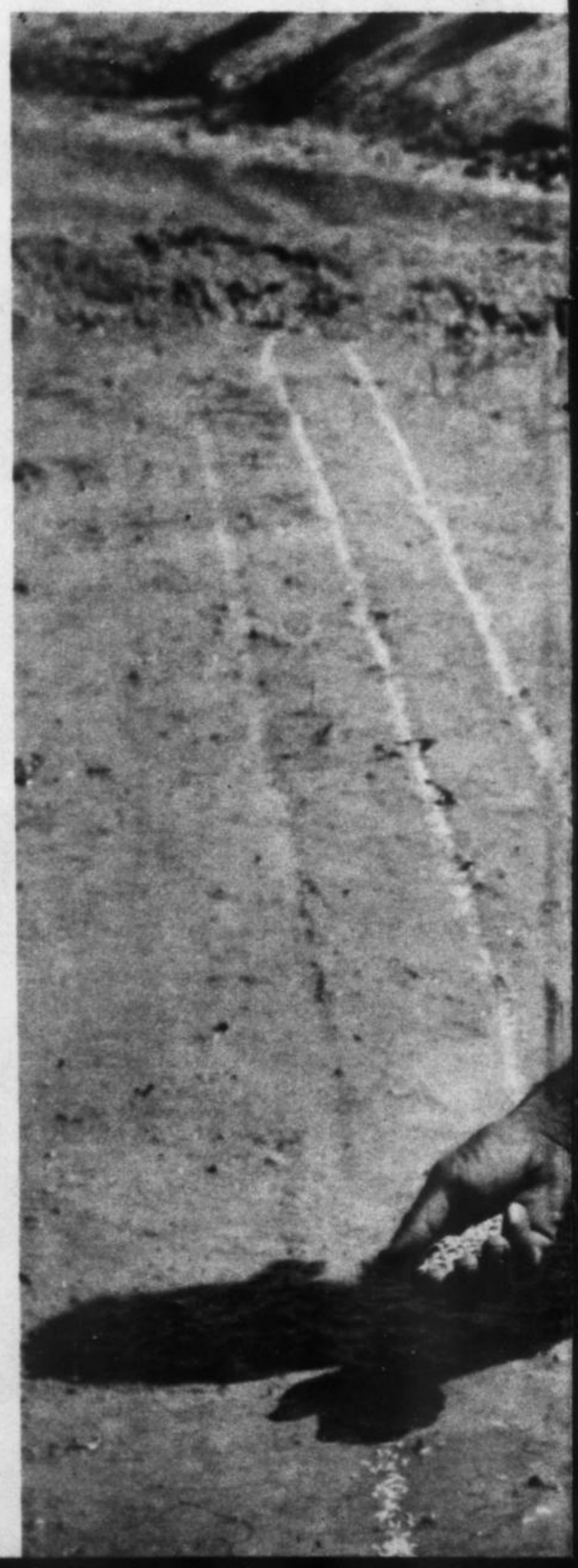
In the northern part of Senegal, in the region around Louga, when traditional methods of cultivation were used, the land was allowed to lie fallow for long periods of time and this kept the soil structure in good condition. With the unchecked increase in population and in the acreage which had to be devoted to the groundnut crop, fallow land has been reduced—indeed, in the already overpopulated area inhabited by the Serer people, sometimes even totally eliminated—and thus the amount of humus in the soil has been reduced.

As a result, the less solid components, such as fine sand and loam, are not held firmly in the soil, but get blown away by the wind. What remains is mostly coarse sand which does not retain the water from the all too irregular and infrequent rainfalls. A similar situation is found in the semi-arid belt that stretches across Africa from Mauritania to Chad and the Sudan, and south to Tanzania.

The drought in these regions in

"The top-priority task for our generation ought to be to triple food production between now and the year 2000... To speed up agricultural development is now a basic aim for all the nations in the Third World".

René DUMONT
Hungry Future



1972 caused a wholesale loss of cattle. Over-pasturing has destroyed all vegetation in the proximity of wells. Farther away some dry grass still grows but there is no water to drink. Some cattle are therefore doomed to die either from hunger or thirst. Meanwhile the inhabitants of these regions are suffering great privations and are dying in increasing numbers.

The vast agricultural expanses of the Soviet Union—one hectare per inhabitant plus extensive pasture-land and forests—can, of course, be greatly affected by cold and drought. Nevertheless, the country should have been able to accumulate enough grain reserves, after the excellent harvests in 1970 and 1971, to avoid the necessity of buying so much wheat in 1972-1973. What it did purchase, mainly because it feeds its cattle on grain, is no longer available for famine-stricken areas elsewhere, and these areas can no longer pay the high prices caused by world shortages.

The well-to-do countries eat too much meat produced from cereals and are therefore unable to give proper aid to the poorer countries. A world sugar shortage is also impending, and the scarcity of beef is going to make the inequalities between rich and poor even more glaring.

Since 1960 some effort has been made in Central America to raise cattle production on the latifundia where the *pastos naturales* (natural pasture-lands) had an incredibly low output. In the western part of the Venezuelan state of Guárico which lies within the *llanos* of the Orinoco River, I estimated in 1959 that one hectare yielded 5 kg. of meat (live weight) per year!

The large estates in Guatemala, particularly, have since improved their *pastos* and installed slaughter-houses so that they can export their beef, boned and refrigerated, to the United States where consumption by the well-off, who form the greater part of the population, is constantly rising.

Increased exportation has naturally driven the price of meat up at home and this has led to a drop in consumption, to between 11 and 15 kg. a year per person in many places, in a country where the great majority are already poor enough. The disparity in protein nourishment between the privileged few and the many who remain poor, or who are becoming poorer, is therefore constantly widening.

These new resources thus do not by any means constitute, as was hoped, a springboard for agricultural development and thus for the national economy as a whole. Where land is so unevenly distributed, the great majority of the holdings are inevitably too small to be able to feed the livestock they are required to support. Small farmers have 15 per cent of the country's cattle, but they own only 3 per cent of the grazing lands and are without the means to improve them.

The enormous agricultural potential of the vast under-used natural pasture- ▶

Photo FAO, Rome

lands of "Indian" (as opposed to "Latin") America is thus largely left dormant and unproductive. The Brazilian "miracle", like the Green Revolution in India, is only making the rich richer and the poor poorer.

It does not leave the small producers the minimum buying power that would stimulate a widespread development of vegetable gardening and hence a more general revitalization of agriculture. Central and South America, which are so rich in potential resources, are not even able to make their food production keep pace with their population growth. The agrarian reform in Peru is an attempt to redress this situation, so far without brilliant results.

It was thought in 1950 that education was the key factor in all development, even more important than the accumulation of capital. It is indeed true that capital, to be used to good effect, requires a wealth of knowledge.

The crime of crimes was committed, however, when the schools began teaching—or at any rate instilling in students—a disdain for manual labour, especially that of the farmer, who was "soiled" with mud or dust, depending on the season. In a traditionally stratified society, work on the land was already generally considered sufficiently "degrading".

The farmer's children, anxious for social advancement, consequently—and in a sense, rightly—wished to rise above such "degradation" and this led them to see in school a means of escaping from their dependence on the land. As a result, schools in the tropics have been swelling the numbers of the unemployable.

The Chinese model is more interesting. In China all children begin their education in an environment where work and study are constantly blended, and this, together with their civic training, helps inculcate in them a respect for work—and for workers.

Wage differences are kept to a minimum, which prevents the importing of luxury items. "Relying on its own strength" and "walking on its own two feet", China is modernizing its technology only to the extent that this does not cause unemployment or require too much buying abroad. Out of necessity all by-products are used and therefore it wastes much less than richer countries.

This is not to say that I consider China to be politically and economically perfect. Its rate of agricultural development seems low to me, and even somewhat lower than I thought might be expected from the total reorganization of the agrarian structure and the wide extension of irrigation.

More than two-thirds of Chinese fields are irrigated, compared with only slightly over a quarter of the fields in India, yet China's harvest was only twice that of India, even in a dry year (1972), for something like 750 million inhabitants. China, however, is developing its agriculture without unemployment and without foreign aid. Admittedly an exact duplication of the Chinese model elsewhere would be ill-advised. Fundamental differences, such as historical heritage, traditional outlook, social structure, and especially recent political history, must all be taken into account.

China is not a country or a nation in the Western sense of those terms. It is a continent, very much larger and more populous than the whole of Europe. It has abundant natural resources—which it has skilfully located and learned to exploit—and lives largely cut off from outside influences.

None the less, many of the principles followed in China deserve to be studied, to see whether, and to what extent, they can be adapted elsewhere. Let there be no mistake on one point, however: they will often require as an inescapable condition the abolition of privileges, and consequently a genuine social revolution.

Even without a revolution on the Chinese model, there are many ways in which education might be completely transformed, as it must be if there is to be the kind of general change in outlook that would lead to a more egalitarian society. ■

René Dumont

Photo © Alain Keler, Paris

''People have criticized me because I have said that we are heading for famine. We are not heading for famine—we are already there''.

René DUMONT

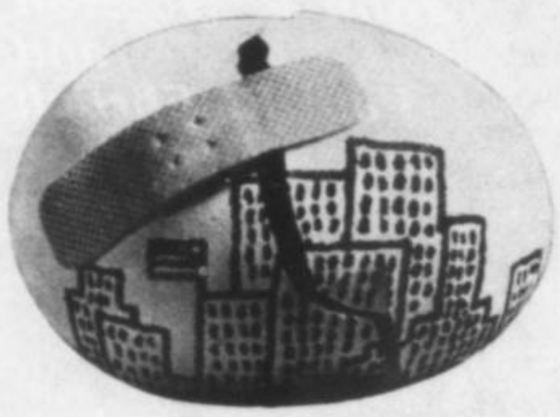
Paysanneries aux abois (Peasants at bay)

Photo George Arakaki © Saul Bass and Associates, Los Angeles

MAN IS COURTING ECOLOGICAL DISASTER

by
John P. Holdren
and
Paul R. Ehrlich

'If population growth proceeds unabated, averting catastrophe will be impossible'



THREE dangerous fallacies appear to be widespread with regard to population growth, environmental deterioration and resource depletion.

The first is that the absolute size and rate of growth of the human population has little or no relationship to the rapidly escalating ecological problems facing mankind.

The second is that environmental deterioration consists primarily of "pollution", which is perceived as a local and reversible phenomenon of concern mainly for its effects on human health.

The third fallacy is that science and technology can overcome all problems arising from the scale and rate of growth.

Environmental problems can be classified according to the direct or indirect nature of the damage to human beings.

Direct assaults include obvious damage to health, damage to goods and services, social disruption (for example, displacement of people by mining operations or hydroelectric projects) and effects on what people perceive as their "quality of life", such as congestion, noise and litter.

Indirect harm is caused by interference with the services provided for society by natural biological systems. Examples are diminution of ocean productivity by pollution of coastal waters and acceleration of erosion by logging or overgrazing.

Most of the attention devoted to environmental matters has been focused on the direct effects. This is only natural. It would be wrong, however, to interpret limited legislative and technical progress toward ameliorating the direct symptoms of environmental damage as evidence that society is on its way to an orderly resolution of its environmental problems. The most serious threats of all may well prove to be the indirect ones generated by man's disruption of the functioning of the natural environment.

The most obvious services provided for humanity by the natural environment have to do with food production. The fertility of the soil is maintained by the plants, animals, and microorganisms that participate in the great nutrient cycles, and soil itself is produced by the joint action of bacteria, fungi, worms, soil mites, and insects. The best protection against erosion of soil and flooding is natural vegetation.

Insects pollinate most vegetables, fruits, and berries. Most fish—the source of 10 to 15 per cent of the animal protein consumed by mankind—are produced in the natural environment, unregulated by man. Most potential crop pests—one competent estimate is 99 per cent—are held in check not by man but by their natural enemies and by the environment (temperature, moisture, availability of breeding sites). Some agents of human disease also are controlled principally not by medical technology but by environmental conditions.

At many stages of the nutrient cycles, organisms accomplish what humans have not yet learned to do—the complete conversion of wastes into resources. Human society depends on these natural processes to recycle many of its own wastes, such as sewage, detergents and industrial effluents. The environmental concentrations of ammonia, nitrites and hydrogen sulphide—all poisonous—are biologically controlled.

These public-service functions of the global environment cannot be replaced by technology now or in the foreseeable future. The sheer size of the task dwarfs civilization's capacity to finance, produce and deploy new technology. The day is far away when food for billions will be grown on synthetic nutrients in greenhouses free of pests and plant diseases, when the wastes of civilization will be recycled entirely

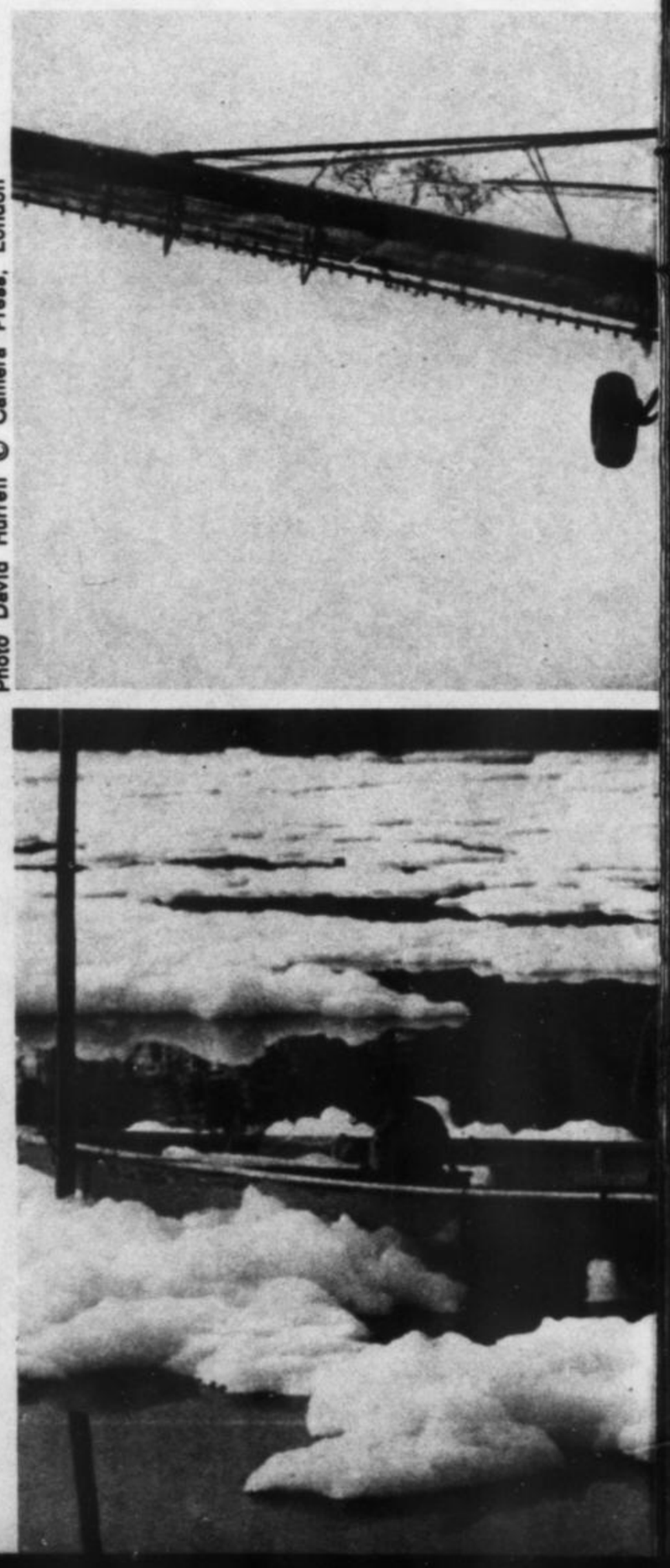


Photo David Hurrell © Camera Press, London

Top photo: an aeroplane sprays insecticide on a potato crop. Insecticides and pesticides are beneficial in many respects, not only helping to reduce the ravages of malaria and other insect-borne diseases in many parts of the world, but also by increasing food production output. However, the excessive use of pesticides, herbicides and chemical fertilizers in recent years, in the face of over-exploitation of land as a result of population growth, is impoverishing the soil, polluting water and seriously threatening the world's ecological balance.

JOHN P. HOLDREN *is assistant professor in the Energy and Resources Programme at the University of California, Berkeley. He has been senior research fellow on environmental and population questions at the California Institute of Technology, and staff physicist in the controlled thermonuclear fusion programme at the Lawrence Radiation Laboratory in Livermore, California. His current teaching and research concern energy technology and policy, environmental aspects of controlled fusion, and global environmental problems.*

PAUL R. EHRLICH *is professor of Biological Sciences at Stanford University, Stanford, California. He has gained international renown as the author of "The Population Bomb", "Population, Resources, Environment" (with Anne H. Ehrlich), and other books on biology and contemporary problems. His work on coevolution and the dynamics and genetics of natural populations has taken him to Africa, Asia, Australia and Latin America.*

by technological means, and when all mankind will live in surroundings as sterile and as thoroughly managed as those of an Apollo space capsule.

Until that improbable future arrives —and it may never come—the services provided by the orderly operation of natural biological processes will continue to be irreplaceable as well as indispensable.

Ecological disruption on a large scale by human beings is not a new phenomenon. One of the best known early examples is the conversion to desert of the lush Tigris and Euphrates valleys, through erosion and salt accumulation resulting from faulty irrigation practices. Overgrazing and poor cultivation practices have contributed over the millenia to the expansion of the Sahara Desert, a process that continues today.

Much of Europe and Asia were deforested by pre-industrial men, beginning in the Stone Age; heavy erosion, recurrent flooding and the nearly permanent loss of a valuable resource were the result. Overgrazing by the Navajo has destroyed large tracts of once prime pastureland in the American southwest.

Attempts to cultivate too intensively the fragile soils of tropical rainforest areas are suspected of being at least in part responsible for the collapse of the Mayan civilization in Central America and that of the Khmers in what today is Cambodia.

Agriculture is a simplifier of ecosystems, replacing complex natural biological communities with relatively simple man-made ones based on a few strains of crops. Being less complex, agricultural communities tend to be less stable than their natural counterparts; they are vulnerable to invasions by weeds, insect pests and plant diseases, and they are particularly sensitive to variations of climate.

The Irish potato famine of the last century is perhaps the best known example of the collapse of a single agricultural ecosystem. The heavy reliance on a single crop led to 1.5 million deaths when the potato monoculture fell victim to a fungus.

Advances in agricultural technology in the last hundred years have aggravated the ecological dilemma. The dilemma can be summarized thus: civilization tries to maximize productivity, while nature operates in a way that maximizes stability, and the two goals are incompatible.

Ecological research has shown that the most complex and therefore most stable ecosystems have the smallest net productivity. In short, productivity is achieved at the expense of stability. Yet mankind must practise agriculture. A tendency toward instability must be accepted and, where possible, compensated for by technology. But the trends in modern agriculture are especially worrisome ecologically.

There are four major liabilities.

- As larger and larger areas are given over to farming, the areas left to carry out the public-service functions of natural ecosystems become smaller and fewer.

- Pressure to expand the area under agriculture is leading to attempts to cultivate land that is unsuitable for cultivation with the technologies at hand. To give but one example among many, attempts to apply the techniques of temperate-zone agriculture to the tropical soils of Brazil and southern Sudan have led to erosion, loss of nutrients, and degradation into the rock-like material called laterite.

- Attempts to maximize yields have led to dramatic increases in the use of pesticides and inorganic fertilizers.

- These attempts have led also to the replacement of a wide variety of traditional crop varieties all over the world with a few, specially bred strains. Unprecedented areas are now planted with a single variety of wheat or rice. This has increased both the probability and the potential magnitude ▶

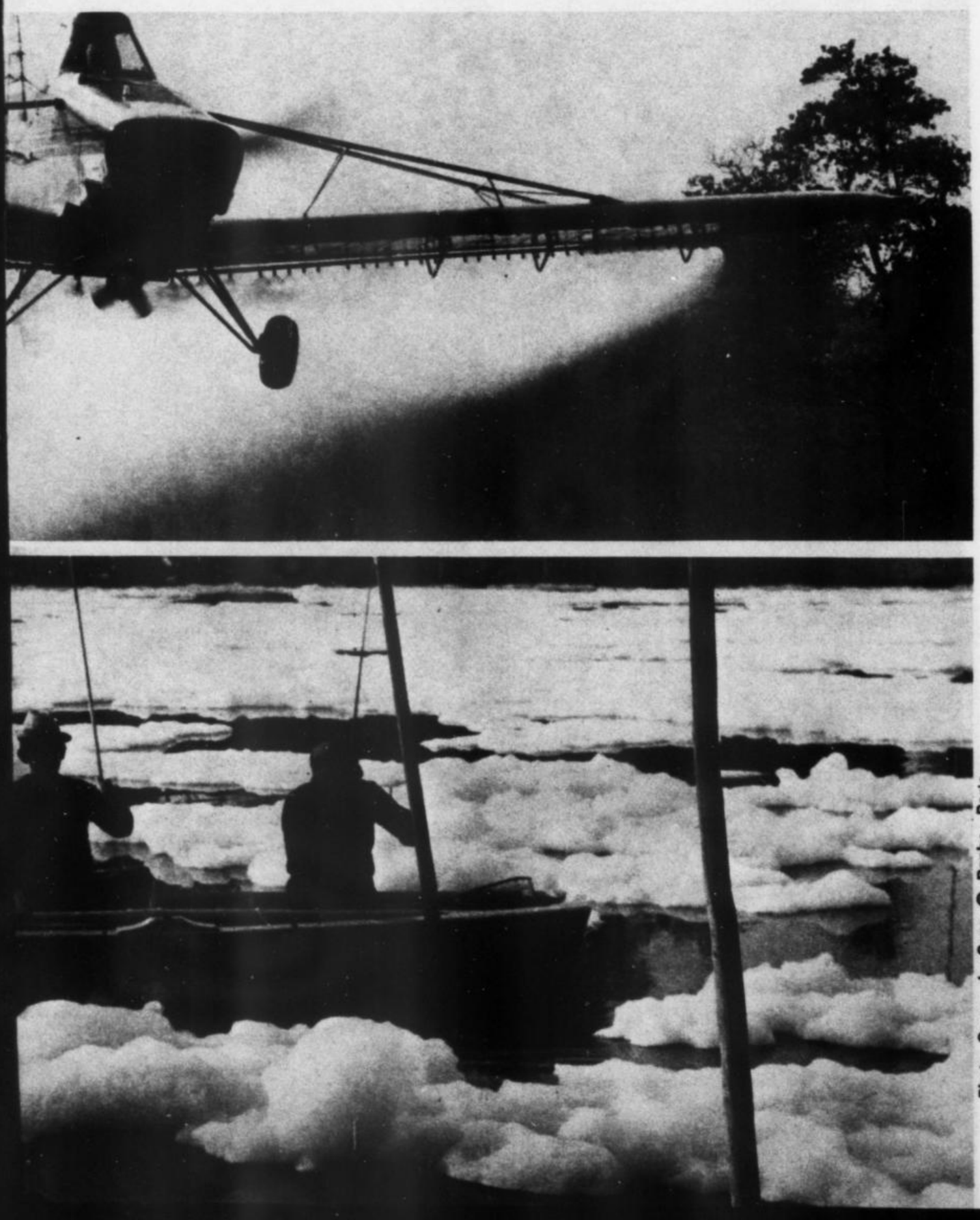


Photo Serge de Sazo © Rapho, Paris

Left: Troubled waters: Just outside Paris, two anglers cast their lines on the Seine, polluted by a cloud of detergent foam. Since they are insoluble in water, detergents have been playing havoc with life in lakes and rivers —killing fish by the thousands and asphyxiating aquatic plants. Chemists are trying to develop new kinds of non-harmful detergents. The damage caused by industrial waste is another formidable problem facing modern society today.

of epidemic crop failure from insects or from disease.

A continuing industrial revolution has multiplied many times over both the magnitude and variety of the substances introduced into the biological environment by man. These may be classified as qualitative pollutants (synthetic substances produced and released only by man) and quantitative pollutants (natural substances released by man in significant additional amounts).

Well known qualitative pollutants are the chlorinated hydrocarbon pesticides, such as DDT, and some herbicides. These substances are biologically active, but since natural organisms have had no experience with them over evolutionary time they are usually not easily biodegradable. Their potential for disruption of ecosystems is enormous.

There are three criteria by which quantitative pollutants may be judged significant.

- Man can perturb a natural cycle with a large amount of a substance ordinarily considered innocuous, as we do when we over-fertilize.
- A relatively small amount of a substance can cause great damage if released in a sensitive spot, over a small area, or suddenly—for example, the destruction of coral reefs in Hawaii by silt from construction sites.
- Any addition of a substance that can be harmful at its natural concentration must be considered significant. Some radioactive substances fall in this category.

The effects on the public-service functions performed by ecosystems are varied and serious. Food chains, for example, are shortened by the selective loss of the predators at the top. This is so because predators are more sensitive to environmental stresses of all kinds than are herbivores.

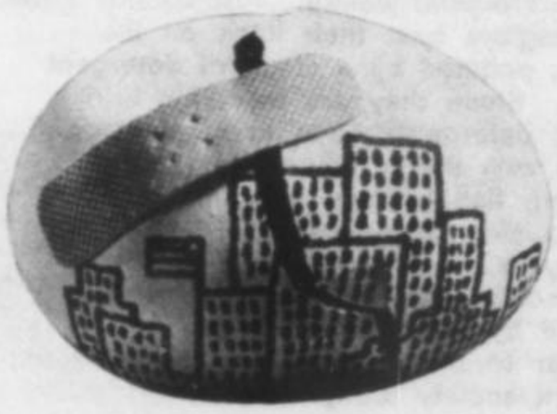
In marine ecosystems the top predators are generally precisely the food fishes most highly prized by man. On land the loss of predators releases checks on herbivorous pests that compete with man for his supply of staple crops, a good example being the increase of cotton pests in parts of Peru. The loss of structure also increases the load on the process of decay, already heavily stressed by man's domestic and agricultural wastes.

The ocean, indispensable as a source of animal protein, may be the most vulnerable ecosystem of all. Its vast bulk is deceiving. Over 99 per cent of the ocean's productivity takes place beneath 10 per cent of its surface area, and half of the productivity is concentrated in coastal upwellings amounting to only 0.1 per cent of the surface.

The reason is that productivity requires nutrients, which are most abundant near the bottom, and sunlight, available only near the top. Only in shallow waters are both available in the same place. The coastal regions also receive most of the oil spills, fallout from atmospheric pollutants and river outflow bearing pesticide and fertilizer residues, heavy metals and industrial chemicals.

Overfishing is almost certainly also taking a heavy toll in the ocean. Since World War II, the catches of the East Asian sardine, the California sardine, the north-west Pacific salmon, the Scandinavian herring and the Barents Sea cod, among others, have entered declines from which there has been no sign of recovery. Present world fisheries production of somewhat over 60 million metric tons per year is already approaching the 100 million that some marine biologists consider to be the maximum sustainable yield.

Photo Lynwood M. Chace © Outdoor Photographers League



Many people still imagine that mankind is a puny force in the global scale of things. This is not so. As a geological and biological force, mankind is today becoming comparable to and even exceeding many natural processes.

Oil added to the oceans in 1969 from tanker spills, offshore production, routine shipping operations and refinery wastes exceeded natural seepage by an estimated 20 times.

Man is now contributing half as much as nature to the atmospheric sulphur burden and will be contributing as much as nature by the year 2000. In industrial areas, the input of sulphur dioxide so overwhelms natural removal processes that increased concentrations are being found hundreds to thousands of kilometres downwind.

Combustion of fossil fuels has increased the global atmospheric concentration of carbon dioxide by 10 per cent since the turn of the century.

Such figures do not prove that disaster is upon us, but they are cause for uneasiness. Mankind is for the first time operating on a level at which global balances could hinge on our mistakes.

At least one environmental problem is absolutely intractable, and that is the discharge of waste heat which accompanies consumption of energy. All the energy we use—as well as that we waste in generating electricity—ultimately enters the environment as waste heat. Obvious examples are the heat from a light bulb and the heat from an automobile engine.

The heat production resulting from man's use of energy is not yet a significant fraction of the solar energy at the earth's surface over the world as a whole. Even if the present five per cent per annum rate of increase persists, it will take another century before civilization is discharging heat equivalent to one per cent of solar radiation. Considerably sooner, however, it could become a significant influence on regional and continental climate.

Human heat production already exceeds 5 per cent of solar radiation over local areas of tens of thousands of square kilometres, and could exceed this level over areas of millions of square kilometres by the year 2000. Such figures could imply substantial climatic disruptions.

Man also has the potential to disrupt climate through additions of various pollutants to the atmosphere. The consequences of climatic alteration reside not in any direct sensitivity of humans to moderate changes in temperature or moisture, but rather in the great sensitivity of food production to such changes.

Photo Eugene Smith © Magnum, Paris

Opposite page: This curious little animal from North America with its petal-like ruffle is a star-nosed mole. Like all moles it is almost blind, but its snout is equipped with delicate feelers for picking its way along the tunnels it digs for the insects and worms on which it feeds. Because moles rip the roots of plants as they tunnel through the earth, they are anathema to farmers and are wantonly destroyed despite their actual usefulness. Many other living creatures which do no harm to man whatever are likewise being ruthlessly slaughtered: 310 species of mammals face extinction, 320 species of birds, 180 reptiles, 90 fish. Left: This cruelly deformed hand belongs to a Japanese suffering from the Minamata Disease, named after the town in Japan where it made its appearance in 1953. The disease was caused by eating fish from coastal waters polluted by mercury waste. Many victims died, others who survived are paralyzed for life. Babies were born with incurable disorders of the nervous or cerebral system. (See "Unesco Courier", July-August 1971).

The effect of climate on agriculture was once again being dramatically demonstrated in early 1973. Famine was widespread in sub-Saharan Africa, and was starting in India. South-east Asia had small rice harvests, parts of Latin America were short of food. Crops were threatened in the United States and the Soviet Union. Over-population is dramatically demonstrated in mankind's inability to store sufficient carry-over food supplies in anticipation of the climatic events which are a regular feature of the planet Earth.

How and how much do population variables themselves contribute to ecological problems? The most elementary relation is that population size acts as a multiplier of the environmental damage caused by each individual. The important point here is that slowly growing factors, when they multiply each other, lead to rapidly growing products.

A simple example is the emission of lead into the atmosphere by automobiles in the United States. Vehicle-miles per person doubled between 1946 and 1967, while emissions of lead per vehicle-mile increased 83 per cent. The United States population increased 41 per cent. The result was that more than five times as much lead was being discharged into the atmosphere as 20 years before, and this dramatic increase arose from rather moderate but simultaneous increases in the contributing factors.

There is however a more difficult and perhaps more important question than this arithmetical one. A small increase in population may generate a large increase in environmental disruption. These effects fall into two classes. First, population change may itself cause changes in consumption per person. Second, a small increase in impact upon the environment —generated in part by population change and in part by changes in the other multiplicative factors—may stimulate a disproportionately large environmental change.

An obvious example is the growth of suburbs in the United States, which has had the effect of increasing the use of the automobile. Another is that of diminishing returns in agriculture, in which the increases in yield needed to feed new mouths can be achieved only by disproportionate increases in inputs such as fertilizer and pesticides. In each case, the contributing factors can no longer be considered to be independent. It is what the mathematicians call a *non-linear* relationship.

Environmental disruption cannot be measured only by man's inputs. Equally important is how the environment responds, and this response itself is often non-linear. One example is the existence of thresholds in the response of individual organisms to poisons and other forms of stress. Fish may be able to tolerate a 10-degree rise in water temperature without ill effect, whereas a 12-degree rise would be fatal.

Another non-linear phenomenon is the simultaneous action of two or more inputs. A disturbing example is the combined effect of DDT and oil spills in coastal waters. DDT is not very soluble in sea water, so the concentrations to which marine organisms are ordinarily exposed are small. However, DDT is very soluble in oil. Oil spills therefore have the effect of concentrating DDT in the surface layer of the ocean where much of the oil remains, and where many marine organisms spend part of their time. As a result, the combined effect of oil and DDT probably far exceeds their individual effects.

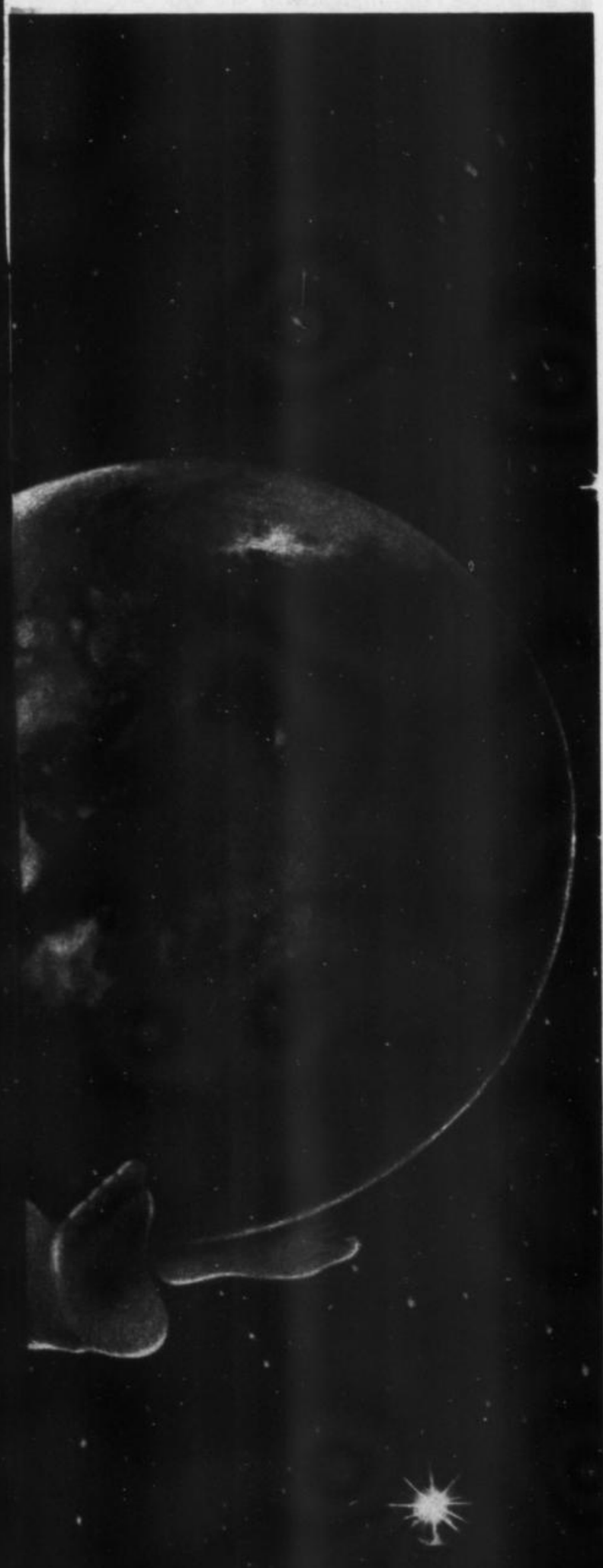
Some forms of non-linearity would occur eventually whether population grew or not. For example, a constant

Drawing by Alexis Oussenko © from "La Bombe 'P'" by Paul R. Ehrlich. Editions "J'ai lu", 1973.

demand for copper that persisted for a long time would lead eventually to substitution of other metals in some applications. In such instances, population growth accelerates the onset of diminishing returns, so leaving less time to deal with the problems and increasing the chances of mistakes. In other cases, such as the effects of population concentration on certain forms of consumption, population change is clearly the sole and direct cause of the non-linear response.

All rational observers agree that no physical quantity can grow forever. This is true of population, the production of energy and other raw materials and the generation of wastes. But is there anything about the 1970s—as opposed, say to the 1920s or 1870s—to make this the decade in which limits to growth become apparent?

When limits do appear, they will appear suddenly. Such behaviour is typical of exponential growth; that is, where the quantity multiplies at a more or less constant rate—with compound interest, so to speak. If a quantity can double 20 times before a limit is reached, the system will be less than half loaded for the first nineteen doublings, or for 95 per cent of the time between initiation of growth and exceeding the limit. Clearly, then, a long history of exponential growth does not imply a long future.



The human population is growing at a rate that would double our numbers in 35 years, and ecological impact is growing even faster. The 1970 Study of Critical Environmental Problems, sponsored by the Massachusetts Institute of Technology, estimated that man's demands upon the biological environment are increasing at about five per cent per year, corresponding to a doubling time of 14 years. Continuation of this rate implies that, if the environment could absorb, say, as much as 32 times the 1970 level of damaging inputs, the limit would be reached by the year 2040.

The likelihood of overshooting the limit is increased by the momentum of population growth, by time-delays between cause and effect in many environmental systems, and by the fact that some kinds of damage are irreversible by the time they are visible.

The momentum of human population growth has its origins in deep-seated attitudes toward reproduction and in the age composition of the world's population, 37 per cent being under 15 years of age. Even if every couple in the world henceforth had only the number of children needed to replace themselves, the imbalance between young and old would cause population to grow for 50 to 70 years more before leveling off. Under extraordinarily optimistic assumptions, world population could not stabilize below eight billion people.

Environmental time delays come about in a variety of ways. Some substances persist in dangerous form long after they have been introduced into the environment. Mercury, lead, DDT and its relatives and certain radioactive materials are obvious examples. They may be entering food chains from soil, water and marine sediments for years after being deposited there. Time lags usually mean that when the symptoms finally appear, corrective action is ineffective or impossible. Species that have been eradicated cannot be restored. Soil that has been washed or blown away can be replaced by natural processes only on a time scale of centuries.

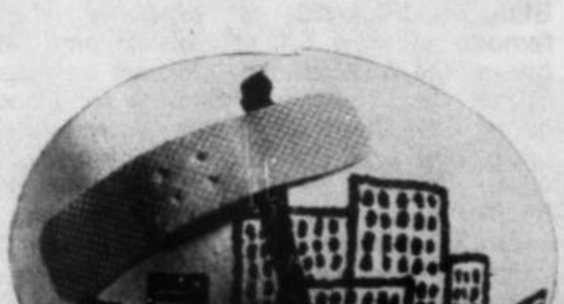
The momentum of growth, the time delays between causes and effects and the irreversibility of many kinds of damage—all increase the chances that mankind may temporarily exceed the carrying capacity of the biological environment. Agricultural failures on a large scale, dramatic loss of fisheries productivity and epidemic disease are among the possible consequences.

The evidence suggests that such possibilities exist within a time frame measured in decades, rather than centuries. This is not to suggest that the situation is hopeless. The point is rather that the potential for grave damage is real and that prompt and vigorous action to avert or minimize the damage is necessary. Such action should include measures to slow the growth of population to zero as rapidly as possible.

It will also be necessary to develop programmes to alleviate political tensions, render nuclear war impossible, divert flows of resources and energy from wasteful uses in rich countries to uses in poor ones, increase the human benefits resulting from each pound of material and gallon of fuel, devise new energy sources, and, ultimately, stabilize civilization's annual throughput of materials and energy.

Ecological disaster will be difficult enough to avoid even if population limitation succeeds. If population growth proceeds unabated, averting disaster will be impossible. ■

John P. Holdren
and Paul R. Ehrlich



The hour of decision

by Boris Urlanis

The U.S.S.R.'s leading demographer declares that the reduction of birth-rates is now an urgent task for certain countries

THE United Nations decision to designate 1974 as International Population Year testifies to the critical nature of the world's population problems. As with the problems of eliminating the nuclear threat, stopping the arms race and safeguarding the environment, the future of mankind depends on their solution.

In speaking of population growth, we should note at the outset the complete polarity of the tasks needing resolution. Two starting points are possible; the need to raise the birth-rate, the so-called pronatalist position, and the need to reduce the birth-rate, the so-called antinatalist position.

Social and economic and physical and geographic conditions differ sharply, and this determines the differences in the tasks facing the countries of the world. In some countries, the birth-rate has fallen to a low level, in certain areas even to an excessively low level; in others the birth-rate is at a high level, even excessively high. The governments of these countries should not look upon the situation passively; influence must be brought to bear on it, actively and effectively. This means pursuing a definite demographic policy.

In the Soviet Union and the European socialist countries such a policy is expressed in measures for stimulating the birth-rate. Some people are sceptical of such measures, believing that they cannot have any noticeable effect on demographic processes. The past few years, however, have definitely proved the groundlessness of such scepticism. In Czechoslovakia, for example, the birth-rate was 14.9 (births per 1,000 persons) in 1968, 15.5 in 1969, 15.9 in 1970, 16.5 in 1971, 17.8 in 1972, and 19.2 for the first nine months of 1973.

Thus, in the past five years, the birth-rate in Czechoslovakia increased nearly one third. This was the direct result of important government efforts aimed at helping women and making it easier for them to combine motherhood with social labour. Czechoslovakia has now surpassed all the European socialist countries (except Albania) in terms of birth-rate.

Appropriate efforts are also being made in the Soviet Union. Apart from general legislative measures and the broadening of the network of pre-school institutions, factors which should ensure a rising birth-rate are improvements in the standard of living, housing and public services. These factors have apparently begun to operate. In 1970 and 1971, there were 170 births per 1,000 women between the ages of 20 and 24, and in 1971 and 1972, the figure rose to nearly 174. The figures for women between the ages of 25-29 were, respectively, a little over 132 and 137.

None the less, this by no means disposes of the need for a more vigorous demographic policy aimed at making it easier for working women to bring up children. Many regions of the Soviet Union at present experience a shortage of manpower resources, and with the future in mind society must be concerned with making up this deficit. Developing the vast expanses of the U.S.S.R. and its massive natural resources will benefit not only the Soviet Union but all mankind.

The question is fundamentally different in the developing countries and even in the economically advanced Western countries. The high birth-rate in many countries has become a serious obstacle to economic growth. In some countries the economic growth rate in fact cannot keep up with the population growth rate. Their economies are like a lorry trying to climb a slippery incline: the wheels spin around, but the lorry stays in one place and sometimes even slides backward.

It would be wrong, of course, to conclude that a high birth-rate is the main or only reason for the difficult

Photo B. Kristul © APN, Moscow

***BORIS URLANIS** is probably the most famous name in Soviet demography. A member of the International Council on Population Studies and the World Society for Population, he is Vice-Chairman of the Scientific Council on Social and Economic Problems of Population, of the Economic Department of the USSR Academy of Sciences. His many books published in Russian include "Population Growth in Europe" (1941), "Population Dynamics and Structure in the USSR and USA" (1964) and "Dynamics of Soviet Population" ((1974). "Wars and Population" a historical analysis, has been published in English (Progress Publishers, Moscow, 1971).*

Photo © APN, Moscow

food situation in many countries. It cannot be denied that rapid population growth in these countries hampers the solution of economic problems and slows down development. But the birth-rate is the result of the social and economic conditions in which the people live: illiteracy among hundreds of millions of people, a low cultural level, the absence of social insurance, backward forms of economic development, the feeble use of women's labour in social production.

Meanwhile, under circumstances of changing social and economic conditions, with the elimination of feudal vestiges and neo-colonialism, these countries, having gained freedom and independence, have effected the emancipation of women and a growth in their culture. In drawing women into social labour they must take advantage of the opportunities that modern science offers for achieving wanted motherhood and family planning, that is, for practising so-called birth control.

Over a half century ago, the eminent American writer, Upton Sinclair, said in *The Book of Life:* "Birth control is a great achievement of the human intellect, equalling the discovery of fire and the invention of the printing press. Birth control means freeing women and all mankind from the blind and irrational fertility of nature, which created us as animals and would gladly have left us in such a state had we not rebelled against it."

The great Indian philosopher and educator, Rabindranath Tagore, stated it more categorically when he said: "The birth control movement is a great movement."

In the deep past, peoples who needed to limit their numbers did so barbarically—by infanticide. That dark period of history is long past. By the Middle Ages, most countries no longer used artificial means for controlling population size. Then, at the close of the Middle Ages, the European aristocracy began practising birth control within the family. This practice steadily became more and more widespread, until it extended to the majority of married couples.

The first to embark on this road were Finland and France, whose populations by the end of the 19th century made up approximately three per cent of the world population. If it can be assumed that perhaps one-third of the married couples in these countries were limiting the number of their children, it may be concluded that at that time birth control was practised by no more than one per cent of the married couples of the world.

At the beginning of the 20th century, a large proportion of the population of Western Europe and the western regions of Russia was regulating the number of children in the family. We estimate that at that time about eight per cent of the world's married couples limited themselves to wanted children.

The tumultuous 20th century, the century of world wars and social revolutions, has sharply changed the position of women. An ever growing proportion of them is being drawn into social labour, and this "new" function of women is beginning to compete more and more with their maternal functions. The patriarchal family is giving way to a new type based on small families and the participation of women in production. By the middle of the 20th century, about one-fourth of all married couples were intentionally limiting the number of children in their families.

During the third quarter of our century, this process will become more intensified. Many countries, large and small, now fall within its sphere of influence. Birth control is practised almost universally in Japan and is becoming increasingly widespread in India and some other Asian countries.

The available information indicates that measures to reduce the birth-rate have also embraced part of the ▶

population of the Chinese People's Republic. It may be considered that today about 45 per cent of the world's married couples limit the number of their children. It is not impossible that this figure will continue to grow so that by the end of this or sometime in the next century it will reach a full 100 per cent.

However, even 100 per cent family planning would not mean that the problem was solved. It is extremely important to know how many children married couples are likely to have before they begin limiting the number of births. If they began, say, after the birth of the fifth child, the effect would be insignificant. Therefore, along with birth control, the governments of a number of countries also encourage the concept of small families. Thus in India young women are advised "not to rush with the second child and to think twice before having the third".

With cultural growth, the increase in the share of women's labour, the reduction of infant mortality, the expansion of social insurance and the disappearance of vestiges of the past, the attitudes of married couples will be oriented to small families.

If half the married couples limit themselves in the future to two children and the other half to three, the number of births would in time approximately equal the number of deaths, and the world's population would in due course become stabilized. Only then can it be expected that the urgency of the population problem will disappear.

This stability will not drop from heaven. It must be achieved and organized. Many people imagine that Marxists have always and everywhere stood and continue to stand for maximum population growth. In fact, this is not the attitude of scientific socialism, but of Utopian socialism. The English scholar and Utopian socialist, William Godwin, for example, wrote in his *Enquiry Concerning Social Justice* (1793) that "The population could grow for a myriad of centuries and the earth would not fail to provide it with food."

Fredrick Engels stated the question another way. After reading Karl Kautsky's book on population problems, he wrote the author a letter in which he said: "The abstract possibility of such a numerical growth of humanity as would raise the necessity of placing limits on this growth naturally exists." Engels' letter was dated 1 February, 1881. Over 90 years have passed, and with the enormous changes that have taken place this is a long enough period for the "abstract possibility" which Engels foresaw to become a concrete necessity.

To bring about the necessary limits foreseen by Engels, changes in the social and economic conditions under which peoples live are essential and along with these changes a corresponding demographic policy. Borrowing the idea of a traffic light, we could say that in today's demographic situation a red light means "panic", a green light, "no problems", and a yellow, "be prepared for a stop".

Sowing panic only means complicating the situation. A green light is also inappropriate since there are no grounds for unconcern. The only wise position is to make a sober evaluation of the situation and take the necessary steps in time. To change the colour metaphor, we might say that intemperate, unconcerned optimists look at these problems through rose-coloured glasses, and over-concerned pessimists, through dark glasses. However, we feel that the glasses should be removed altogether in order to see life as it is. In other words, we should be realists.

The "Green Revolution" in India, Mexico and other countries has made it possible within a short period to increase grain harvests, and this has somewhat mitigated the food problems. It is essential to take full advantage of this respite and to work for a reduction in the population growth rate in countries where it is excessive.

Besides using the short variety of wheat that gives less stalk and more grain, there are many other ways to increase harvests. While the average yield in the U.S.S.R. was 1,020 kilogrammes per hectare between 1961 and 1965, and 1,370 kg. between 1966 and 1970, it rose to 1,760 kg. in 1973, or 26 per cent higher than in the preceding Five Year Plan period.

Fertilizers, mechanization and land improvement are all means of increasing agricultural output, but one must not conclude that there is no food problem in the world. According to the Food and Agriculture Organization, nearly one billion people are starving or are seriously undernourished. However, an increase in agricultural output in many countries requires material resources and a social system which they do not have. Under these conditions, their population problems

Photo © APN, Moscow

are especially acute, and along with them is the problem of birth control. The neutrality of the United Nations in this matter reflects respect for all beliefs and views, but in the long run it can bring peoples only harm.

The role of the United Nations and its specialized agencies, including Unesco, in solving population problems can be distinctly traced at international demographic congresses. At the first (Rome 1954), only timid steps were taken—towards expanding research and gathering statistics and estimates of the future world population.

The second congress, held 11 years later (Belgrade, 1965), provided a broad forum at which population questions were subjected to all-round and penetrating discussion, since they had by then assumed the dimensions of problems demanding solution.

Various opinions were expressed, different positions were brought to light, various ideas were suggested.

Nearly nine years have gone by since then. The time for talking has passed; it is now time for action. It is clear that in a number of countries the reduction of birth-rates must become a task of national urgency. The accomplishment of this task, however, should not encroach on the sovereignty of governments and families. Firm recommendations are needed on how to carry out a demographic policy which would have a decisive effect on the reproductive habits of married couples in the respective countries. This, in turn, requires considerable funds and clear legislation.

State finances are handled by governments, and government institutions pass the laws. Therefore, the U.N. was wise to convene a third congress at government level, for August, 1974, in Bucharest, the capital of Romania. This congress, it is hoped, will mark a new stage by studying population problems in terms of concrete measures for their solution.

An active demographic policy involves not only control over the birth-rate or, conversely, its stimulation, but also measures for reducing the death-rate. There has been unquestionable progress in the fight against infant mortality in nearly all countries. But the situation with adult mortality has in some respects worsened: at least two million people die each year from accidents alone.

Perhaps at the Bucharest Congress it would be useful to raise the question of establishing an international accident prevention centre to fight against all forms of accidents: street, home and industrial. It should also be remembered that in many countries there is a growing proportion of old people who see poorly and hear poorly and are therefore more accident-prone.

I am reminded of a parable. Once upon a time an Eastern ruler summoned his wise men and ordered them to write the history of mankind. Being unequal to the task, they decided to answer him in brief: "People were born, suffered and died". The International Population Year should add a sizeable contribution to the great common fund of achievements in the natural and social sciences, so that a brief history of mankind would go like this: "People were born, did not suffer and lived a long and happy life."

Boris Urlanis

A new global model analyses four options for tomorrow in the face of looming disaster

A COMPUTER WARNING OF HUNGER TOMORROW

by Mihajlo Mesarovic, Eduard Pestel and Maurice Guernier

Photo Marylin Silverstone © Magnum, Paris

The authors of this article, members of the Club of Rome, collaborated in a new global computer study on the interrelationship of population, food resources, energy and economic growth, to be published next October. Here they present its conclusions with regard to food and population.

MIHAILO D. MESAROVIC, *of the U.S.A., is professor of engineering and mathematics and director of the Systems Research Center at Case Western Reserve University, Cleveland.*

EDUARD PESTEL, *of the Fed. Rep. of Germany, is professor of engineering and director of the Institute of Mechanics at the Technical University of Hanover.*

MAURICE GUERNIER, *French economist specializing in problems of tropical agronomy, has led several African development planning missions, in Cameroon, Dahomey, Chad, Rwanda and Burundi.*

IN recent years, a considerable number of studies have appeared on global problems. These studies have analysed the demographic characteristics of the world and their projected pattern to the year 2000, agriculture, food supplies, energy resources, etc. Each of them is extremely important in its field.

However, these problems are closely connected. The future of agriculture for example can be discussed only in terms of future needs and therefore of demographic growth. Demographic growth is in turn directly related to food and other factors.

To forecast world population 30 or 50 years ahead is therefore feasible only if account is taken of all the factors in the equation, particularly agriculture, food, fertilizers and energy, both in a given region and in others where the picture may be different.

This phenomenon—the interaction, the inseparable fusion of all these problems—might be termed the "world problem complex". In other words, all these analytical studies are valid only if they are linked together in a global network—the world problem complex. And yet it is equally essential to recognize the world's diversity. One cannot speak of the world's food problem, but only of North America's food problem, Western Europe's food problem, the Soviet Union's, South Asia's, etc., and each is profoundly different. There may be famine in one region, abundance in another. We must therefore agree that the world is at the same time one world and many. To understand it properly, it must be studied in its unity and in its diversity.

The future obviously is uncertain.

But we can anticipate its characteristic features if at first we learn to understand the unity and the diversity. We should then be able to forecast probable trends, so that finally—because we understand the causes—we may be in a position to choose between a number of possibilities.

The new world study, which we have completed at the request of the Club of Rome, had exactly this purpose of understanding our planet better, of discerning future trends more surely, so that it might be possible to influence the future, by heading off catastrophes, by averting large-scale injustice, and by promoting a better quality of life...

The study required two years of work with a large team of specialists, and culminated in the construction of what we call the Mesarovic-Pestel Model (1). All the data are recorded in three computers situated at Cleveland (Ohio), Hanover (Fed. Rep. of Germany) and Grenoble (France), which can be questioned by telephone or satellite from any part of the world.

True to the concept of the world's diversity, all the data registered relate to ten large regions—North America, Western Europe, Japan, Australia-South Africa, U.S.S.R. and Eastern Europe, Latin America, the Maghreb (North Africa) and Near East, tropical Africa, South Asia, China. There are therefore ten autonomous economic models, which allow one region or a group of regions to be studied, but there is also in effect a single world model, since the ten sections are interlinked. This model is thus a reflection of the world's unity and diversity.

A second major characteristic is that the Model is a "multi-level" one, comprising data on natural resources (oil deposits, mineral reserves), technological data (industry), economic data and so on. All these data are interlinked, since they react one with the other.

A third characteristic is that the Model constitutes, not a means of predicting the future—manifestly an absurdity—but a tool for understanding what is likely to happen if—on the first hypothesis—events are allowed to unfold without hindrance, or if—on the alternative hypothesis—various different kinds of action are taken. The different possible policies fed into the computer are called "scenarios". Each scenario elicits a reply derived from all the basic data of the Model.

A final important characteristic of the Model is that—obviously—it does not record all the countless world data, but only the principal basic relationships. To put it in simplified terms, what the Model brings into play essentially are the demographic characteristics, the food requirements, energy, economic growth—in short, the major construction materials of the future, the materials with which, if he holds them in his hands, man can build a better world.

Here are some of the principal conclusions of the Mesarovic-Pestel Model, in particular with regard to population and food.

The most crucial questions in this respect are: Is the precarious state of the world food supply situation a temporary aberration, resulting from inadequate attention given to the problem and which therefore can be remedied quite readily? Or is it a persistent or even worsening problem whose solution would require major efforts? If the latter is true, the next and most urgent question is: What are the characteristics of the different strategies which can be used to avert a catastrophe?

Analysis of the first question produced the conclusion that the historical pattern of development will make the situation increasingly worse until it reaches truly catastrophic proportions. In considering the second question we analysed a number of scenarios and were able to identify some basic components which any strategy aimed at the solution of the world food situation must have.

Our world model has certain features of special relevance to the food-population problem. The model contains a detailed representation of diet and food types, region by region, and is based on 26 different varieties of food. The model also incorporates the effect that is produced by lack of essential diet elements, such as protein, on the population.

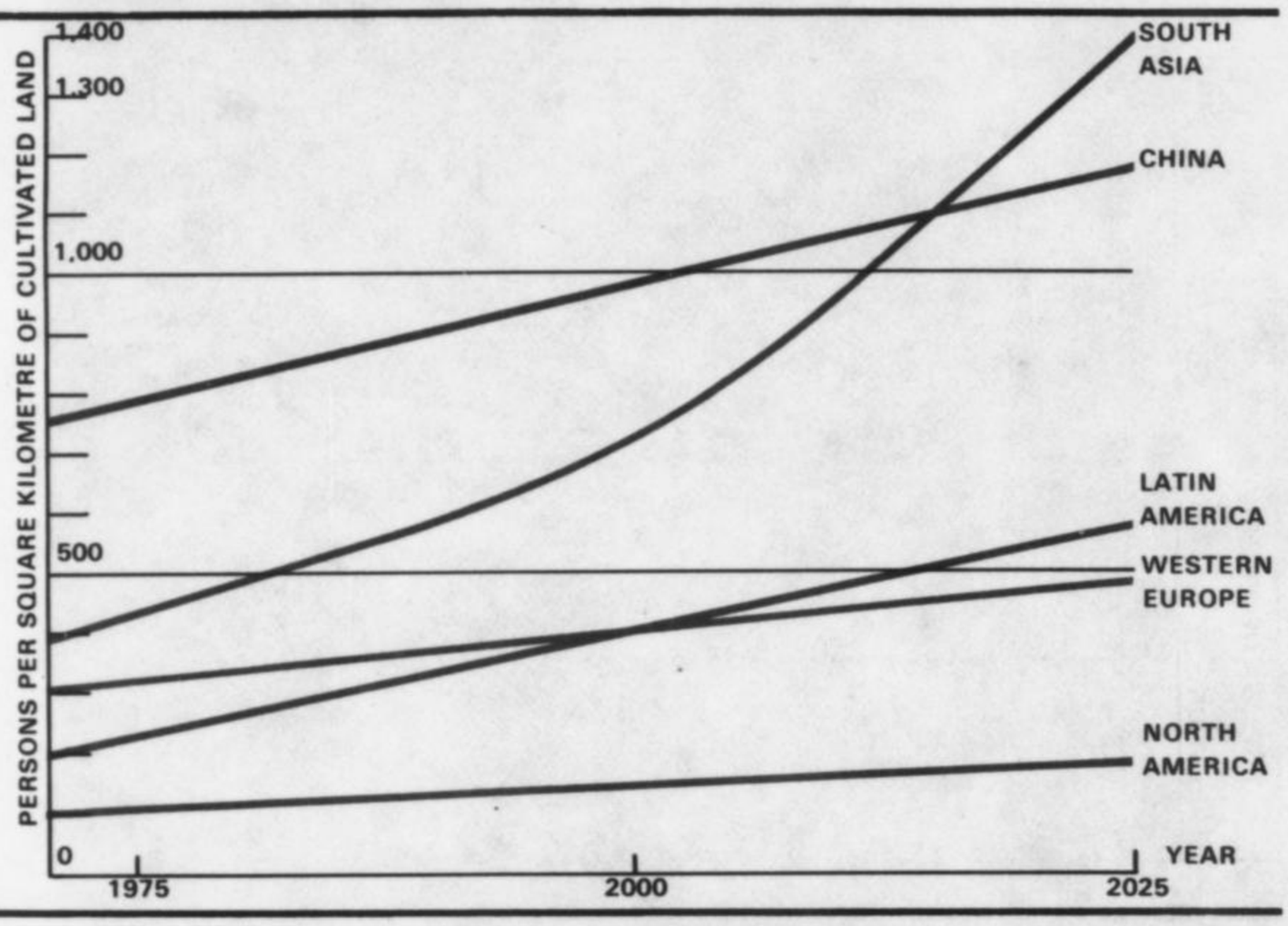
The regionalization of the model is most important here since, although ▶

---

(1) The study was effected with the aid of the Volkswagen Foundation, Fed. Rep. of Germany.

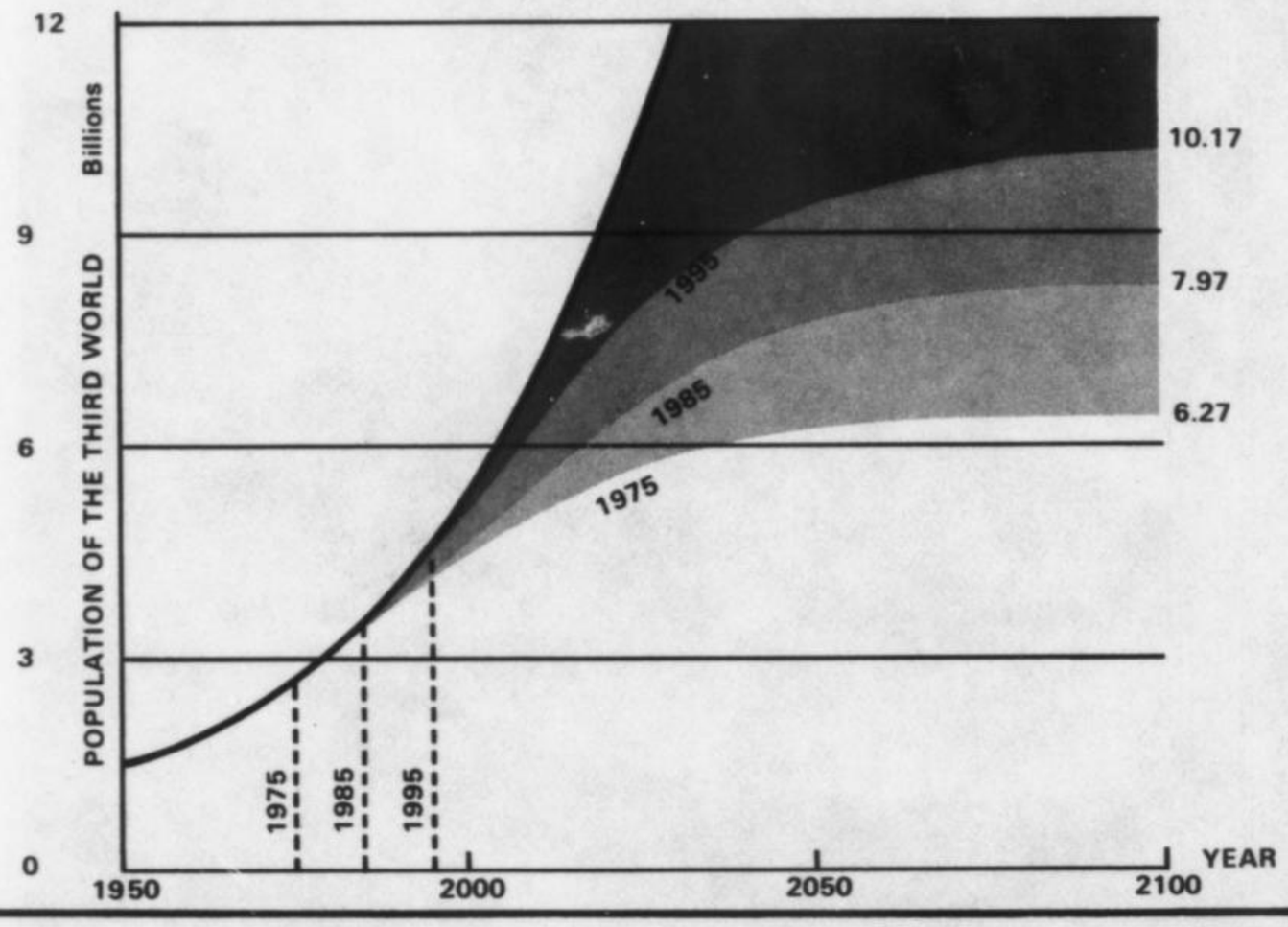
MOUNTING PRESSURE ON THE LAND

The four graphs on these pages were produced by a computer on the basis of data provided by a new world computer model elaborated by M.D. Mesarovic and E. Pestel. According to these studies, certain catastrophic events await the world before the year 2025. The graph, right, shows how the density of the population, expressed in numbers of persons per square kilometre of cultivated land, is exercising pressure on the food production potential of 5 major regions of the world. The study states that the worst hit will be South Asia, where every square kilometre of cultivated land now supports 370 human beings. In the year 2000 it will have to feed 700 persons, and 1,370 by 2025. In Western Europe, by contrast, each square kilometre will have to feed less than 500 persons by the year 2025.



POPULATION EQUILIBRIUM FOR THE DEVELOPING WORLD

The thick black line on graph, right, shows in billions how the population of the Third World would grow if the present average growth rate were to continue. It would reach the figure of 12 billion around the year 2030. The curve labelled 1975 indicates that the Third World's population would level off around the year 2060 at a figure of 6.27 billion if population controls were introduced now. The other two curves show that if population controls were introduced in 1985 and 1995, the Third World's population would level off at 7.97 billion (around 2070), and 10.17 billion (around 2085).



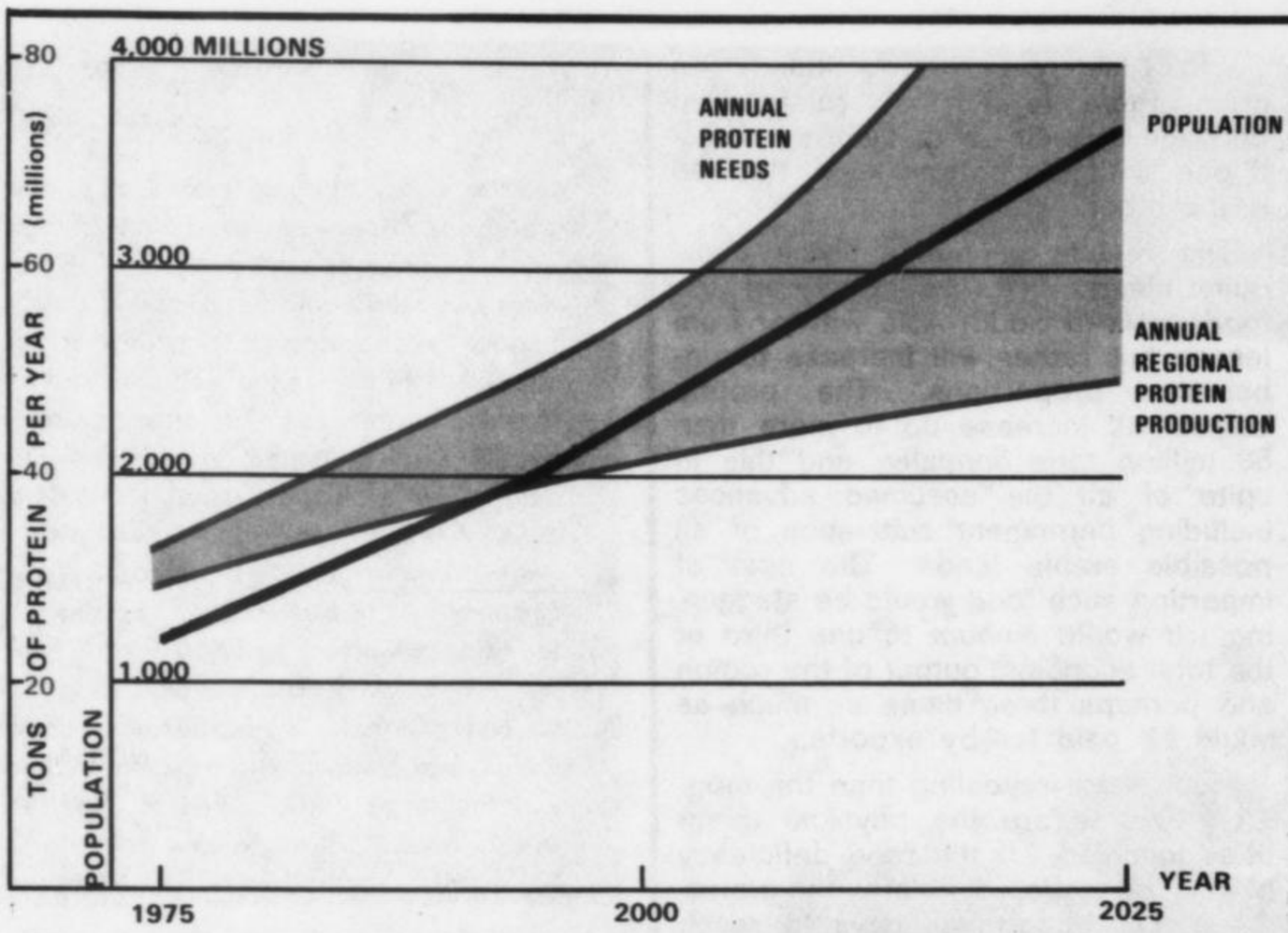
we are talking of the "world" food problem, the location of actual food supplies and the location of actual food deficits are clearly crucial factors. For example, the potential for increasing the production of prime beef in Latin America is of minor importance for the relief of food shortages in South Asia, especially if it is potential in the sense of assuming use of land yet to be developed.

The comprehensiveness of our approach, as exemplified by the number of data levels included in the Model, is also important. Too often the question of food supply is considered solely within the confines of economics. It might be stated for example that all we need is a three per cent annual increase in agricultural output and this is represented in monetary terms. Yet one does not eat dollars but grain; the real question is how much food can be produced in physical terms. Hence a mere accountant's approach is not sufficient here.

Nor can the world food supply problem be solved by a laboratory-type approach, since the problem is not what a wizard could do if he could transform all arable land in the world into a greenhouse, but rather what can be produced with the land of the type and area we have available, using the economic and human resources which exist at a given time. Assessing the development of world food supply on the basis of laboratory or experimental results leads to rather naïve, if not downright irresponsible, conclusions. One is dealing, after all, with human lives, which should not be considered so lightheartedly.

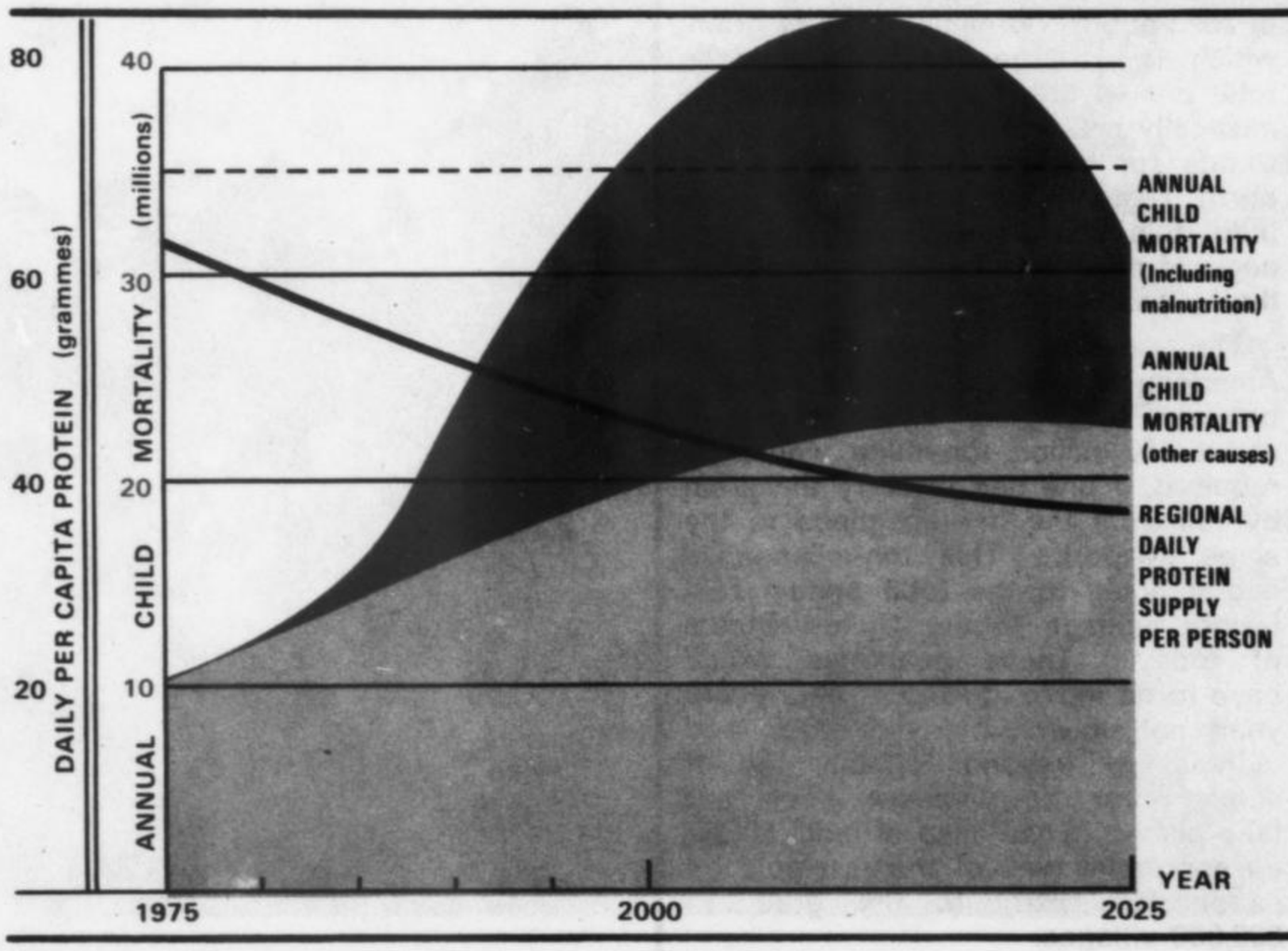
Another important feature of our model is its capacity to consider in realistic terms the relationship between the implementation of a population policy and its effects on population change. Our population sub-model

Photo © Nils-Erik Wikeback, Karlstad, Sweden



SOUTH ASIA'S FOOD GAP

On the graph, left, the black line represents the population increase in South Asia, assuming that a population policy is initiated that leads to equilibrium fertility in about 50 years, so that population grows from 1.3 billion in 1975 to 3.8 billion in 2025. It is also assumed that there will be no starvation to slow down population growth. In this situation the annual protein needs of South Asia (top curve) would increasingly surpass its own annual protein production (bottom curve), thereby resulting in a protein deficit of an estimated 50 million tons in the year 2025. (This protein deficit is represented by the pink area.) Even if these 50 million tons of protein were available elsewhere in the world for export to South Asia, it would pose practically insurmountable transport and distribution problems.



CHILD MORTALITY AND FOOD DEFICIENCY IN SOUTH ASIA

On graph, left, referring to South Asia, the horizontal black dotted line depicts the total daily protein ration considered necessary for each person —70 grammes—and the falling black curve represents the daily regional per capita protein supply that would exist if South Asia's population were to grow to 3.8 billion people in 2025. If South Asia does not import enough food in the years ahead, the Mesarovic-Pestel model foresees half a billion children in South Asia dying of hunger by the year 2025 (red area on graph.). Pink area shows number of children who are expected to die up to the year 2025 from other causes, even if food is available. The above figures are considered by the authors of the Mesarovic-Pestel world study as very rough estimates and should not be considered as firm forecasts.

shows that if current trends prevail there will be by the end of this century more people in the "South" than in the entire world today, and in another 25 years three times as many.

What would happen thereafter is so astronomical as to be almost ridiculous to consider. There is no question as to whether such development will take place or not. The only question is whether the slowdown of population growth will be the result of a deliberate population policy or the result of "natural forces"—primarily starvation and malnutrition.

We can feed into our model a range of population policies aimed at bringing the population to equilibrium, at different times and at different levels, and implemented with various degrees of effectiveness.

The need to show the results of various population policies in a realistic manner is apparent when one appreciates the delays between the start of implementation and the effect. For example, if a fully effective population policy, starting in 1975, achieves its aim of bringing the *fertility* rate in the entire "South" region to an equilibrium level in 35 years, the *population* equilibrium is not reached until 75 years after the initiation of the policy, that is 40 years after the objective of fertility equilibrium has been reached.

Moreover, by the time population equilibrium has been attained, the population will be more than twice as high as when the policy is initiated. The need to look at least 50 years ahead, when considering the development of the world system, is thus self-evident. Unfortunately, few people are willing to look 50 years ahead.

Finally, the strains on regional resources can be appreciated from the fact that on each square kilometre of cultivated land in the South Asia region there will be, in the year 2000, 330 additional persons to be fed, and 1,000

additional persons in the year 2025. These figures should be compared with those for North America, where there will be an additional 37 persons per square kilometre of cultivated land in the year 2000 and 80 more persons in 2025. To cap all this, the rate of growth of urban population in South Asia is twice the growth rate of the total regional population.

It is not surprising that the most critical situation regarding food supply is in South Asia and Tropical Africa. Here we shall restrict ourselves to South Asia, since it represents the biggest problem because of the sheer numbers involved.

We shall present the results in reference to some key scenarios, each representing a plausible sequence of events resulting from various political decisions and social choices.

First scenario

The purpose of the *first scenario*, called "Standard", is to obtain an indication of the persistency of the food gap during the next 50 years: in particular, whether the food situation is going to be better or worse and by how much.

The scenario assumes that the historical pattern of development based on a somewhat optimistic view of the past and present situation will continue. In particular, a population policy is assumed which will be successful in bringing the fertility rate to equilibrium level in about 50 years. It is also assumed, optimistically, that the average use of fertilizer per hectare in the entire region will surpass the present North American level towards the end of the relevant time-period. This will allow yields to increase by about 1,000 kilogrammes per hectare, again on average, i.e. taking into account every piece of land under cultivation.

This in fact is about the increase which the Green Revolution has brought on average in the best of all lands in India and Pakistan. It is also assumed that all remaining arable land is quickly brought under cultivation and that all the necessary technological inputs including irrigation will be available.

Finally, in order to assess the magnitude of the food problem, we assume that no massive starvation takes place; the difference between needs and regional production will then indicate the food deficit which has to be made up by regional imports as outright aid if starvation is to be prevented.

As regards food production, we focus on a total protein content of the food produced because it is here that the worst shortages exist in the present food supply situation. The average diet of protein in more than half of the world is estimated to be about two-thirds of the daily need, and in animal protein hardly one fourth. Furthermore, since food supply in South Asia relies predominantly on grain, there is a close relationship between protein and caloric intake. If one is at the bottom level, then so is the other.

The results of our analysis show quite clearly that the gravity of the food crisis in South Asia will far from lessen but rather will increase to unbearable proportions. The protein deficit will increase up to more than 50 million tons annually; and this in spite of all the assumed advances including permanent cultivation of all possible arable land. The cost of importing such food would be staggering. It would amount to one third of the total economic output of the region and perhaps three times as much as could be paid for by exports.

Much more revealing than the monetary figures are the physical quantities involved. If the food deficiency has to be covered chiefly by grains, the annual import will have to reach in 2025 about 500 million tons of grain, which is a larger amount than the total annual grain production, as optimistically projected from the historical trends for the year 1980, in all the north regions combined. In sheer bulk, this would be double the tonnage of all goods being shipped from the United States overseas at present.

The average haul from the North American Mid-West to either coast is between 1,000 and 2,000 miles, so about 750 billion ton-miles would be required, if one had to carry the grain by rail from the harvest place to the ships in port. This ton-mileage is nearly equal to the total annual rail-freight mileage in the United States of today. These quantities would have to be moved to South Asia every year, not only in the year 2025, and increasingly beyond, without end, if some other development does not take place. In the case of India alone, an enormous fleet of trucks would be needed to distribute the grain to 500,000 villages.

Second scenario

Clearly, such a development is not sustainable. But what would happen if the needed food imports were not provided? This is analysed in the *second scenario*, in which all other assumptions have remained the same, except the assumption that the food imports will be covered by someone from somewhere. This assumption is removed. The result is diet deficiency and mass starvation.

The catastrophe would start some time in the early 1980s and would reach its peak around the year 2000, when the deaths related to food deficit would more than double; after that peak the natural consequences would start bringing the population down. The number of food deaths related to child-birth would aggregate to about 500 million children, from 1980 up to the year 2025 ; and the sufferings, of course, would continue for many decades beyond. In such catastrophic

CONTINUED PAGE 68

Colour pages

On the following colour pages we publish a series of posters on world population and its effects on employment. The posters have just been published by the International Labour Organization (ILO) with financial support from the United Nations Fund for Population Activities. The drawings are by the Danish graphic artist Björn Frank Jensen. In a triple operation, ILO published a set of posters (reproduced here with the original English text), a booklet of strip cartoons on the same subject and with the same characters, and a 10-minute cartoon film (produced by Toonder Studios in the Netherlands). The posters also exist in French and Spanish, and the cartoon booklet and film have English, French, Spanish or Arabic texts. (See also our cover.)

300 MILLION!

That's the number of additional people that will be looking for work in the world during the next ten years. The question is: will there be enough work for them?

additional persons in the year 2025. These figures should be compared with those for North America, where there will be an additional 37 persons per square kilometre of cultivated land in the year 2000 and 80 more persons in 2025. To cap all this, the rate of growth of urban population in South Asia is twice the growth rate of the total regional population.

It is not surprising that the most critical situation regarding food supply is in South Asia and Tropical Africa. Here we shall restrict ourselves to South Asia, since it represents the biggest problem because of the sheer numbers involved.

We shall present the results in reference to some key scenarios, each representing a plausible sequence of events resulting from various political decisions and social choices.

First scenario

The purpose of the *first scenario*, called "Standard", is to obtain an indication of the persistency of the food gap during the next 50 years: in particular, whether the food situation is going to be better or worse and by how much.

The scenario assumes that the historical pattern of development based on a somewhat optimistic view of the past and present situation will continue. In particular, a population policy is assumed which will be successful in bringing the fertility rate to equilibrium level in about 50 years. It is also assumed, optimistically, that the average use of fertilizer per hectare in the entire region will surpass the present North American level towards the end of the relevant time-period. This will allow yields to increase by about 1,000 kilogrammes per hectare, again on average, i.e. taking into account every piece of land under cultivation.

This in fact is about the increase which the Green Revolution has brought on average in the best of all lands in India and Pakistan. It is also assumed that all remaining arable land is quickly brought under cultivation and that all the necessary technological inputs including irrigation will be available.

Finally, in order to assess the magnitude of the food problem, we assume that no massive starvation takes place; the difference between needs and regional production will then indicate the food deficit which has to be made up by regional imports as outright aid if starvation is to be prevented.

As regards food production, we focus on a total protein content of the food produced because it is here that the worst shortages exist in the present food supply situation. The average diet of protein in more than half of the world is estimated to be about two-thirds of the daily need, and in animal protein hardly one fourth. Furthermore, since food supply in South Asia relies predominantly on grain, there is a close relationship between protein and caloric intake. If one is at the bottom level, then so is the other.

The results of our analysis show quite clearly that the gravity of the food crisis in South Asia will far from lessen but rather will increase to unbearable proportions. The protein deficit will increase up to more than 50 million tons annually; and this in spite of all the assumed advances including permanent cultivation of all possible arable land. The cost of importing such food would be staggering. It would amount to one third of the total economic output of the region and perhaps three times as much as could be paid for by exports.

Much more revealing than the monetary figures are the physical quantities involved. If the food deficiency has to be covered chiefly by grains, the annual import will have to reach in 2025 about 500 million tons of grain, which is a larger amount than the total annual grain production, as optimistically projected from the historical trends for the year 1980, in all the north regions combined. In sheer bulk, this would be double the tonnage of all goods being shipped from the United States overseas at present.

The average haul from the North American Mid-West to either coast is between 1,000 and 2,000 miles, so about 750 billion ton-miles would be required, if one had to carry the grain by rail from the harvest place to the ships in port. This ton-mileage is nearly equal to the total annual rail-freight mileage in the United States of today. These quantities would have to be moved to South Asia every year, not only in the year 2025, and increasingly beyond, without end, if some other development does not take place. In the case of India alone, an enormous fleet of trucks would be needed to distribute the grain to 500,000 villages.

Second scenario

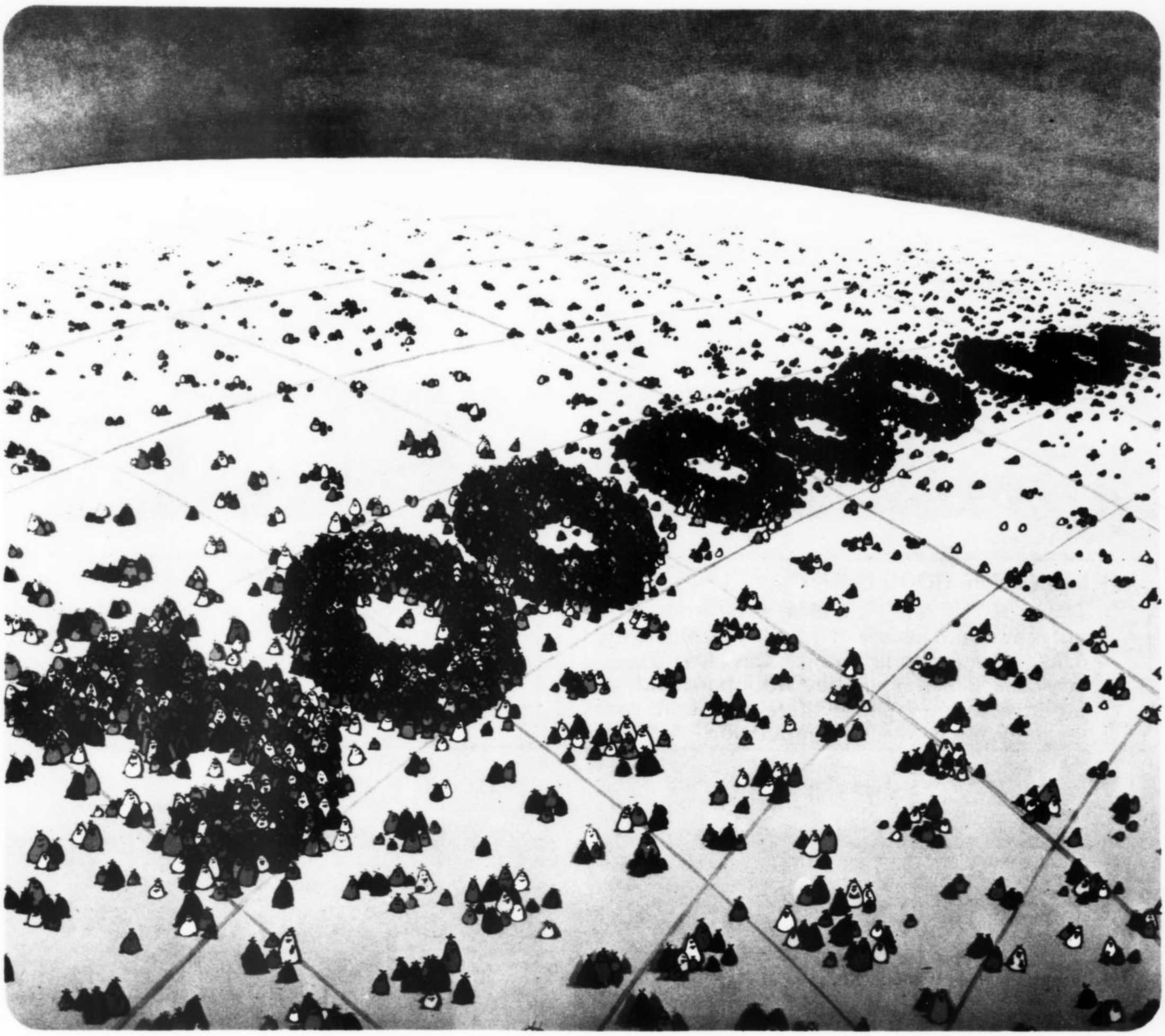
Clearly, such a development is not sustainable. But what would happen if the needed food imports were not provided? This is analysed in the *second scenario*, in which all other assumptions have remained the same, except the assumption that the food imports will be covered by someone from somewhere. This assumption is removed. The result is diet deficiency and mass starvation.

The catastrophe would start some time in the early 1980s and would reach its peak around the year 2000, when the deaths related to food deficit would more than double; after that peak the natural consequences would start bringing the population down. The number of food deaths related to child-birth would aggregate to about 500 million children, from 1980 up to the year 2025; and the sufferings, of course, would continue for many decades beyond. In such catastrophic

CONTINUED PAGE 68

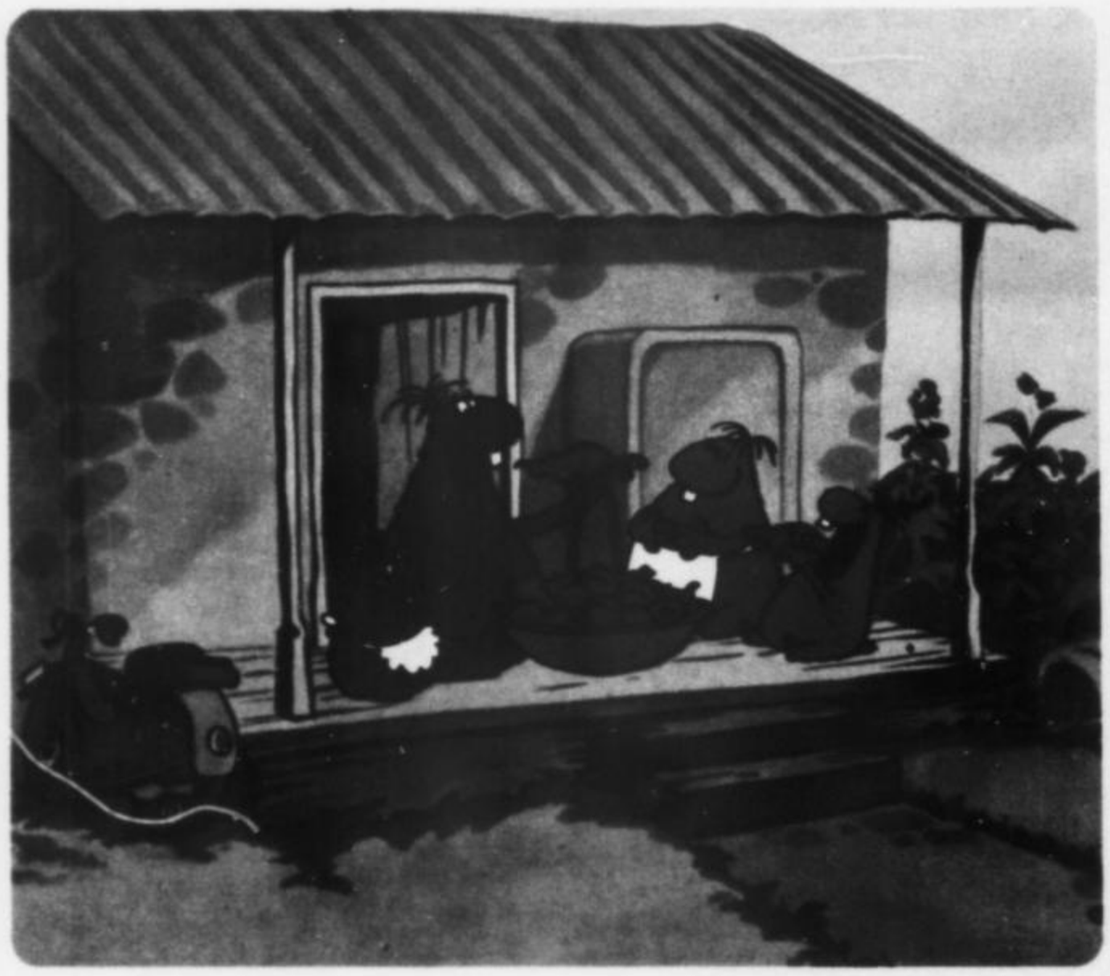
Colour pages

On the following colour pages we publish a series of posters on world population and its effects on employment. The posters have just been published by the International Labour Organization (ILO) with financial support from the United Nations Fund for Population Activities. The drawings are by the Danish graphic artist Björn Frank Jensen. In a triple operation, ILO published a set of posters (reproduced here with the original English text), a booklet of strip cartoons on the same subject and with the same characters, and a 10-minute cartoon film (produced by Toonder Studios in the Netherlands). The posters also exist in French and Spanish, and the cartoon booklet and film have English, French, Spanish or Arabic texts. (See also our cover.)



300 MILLION!

That's the number of additional people that will be looking for work in the world during the next ten years. The question is: will there be enough work for them?



LIVING THE GOOD LIFE

These people don't look like you or me, but they could be any of us—any of the nearly 4,000 million people living today.
They can live well, IF they work hard and produce enough, and IF there's enough work for the world's swelling population.

IS THIS OUR FUTURE?

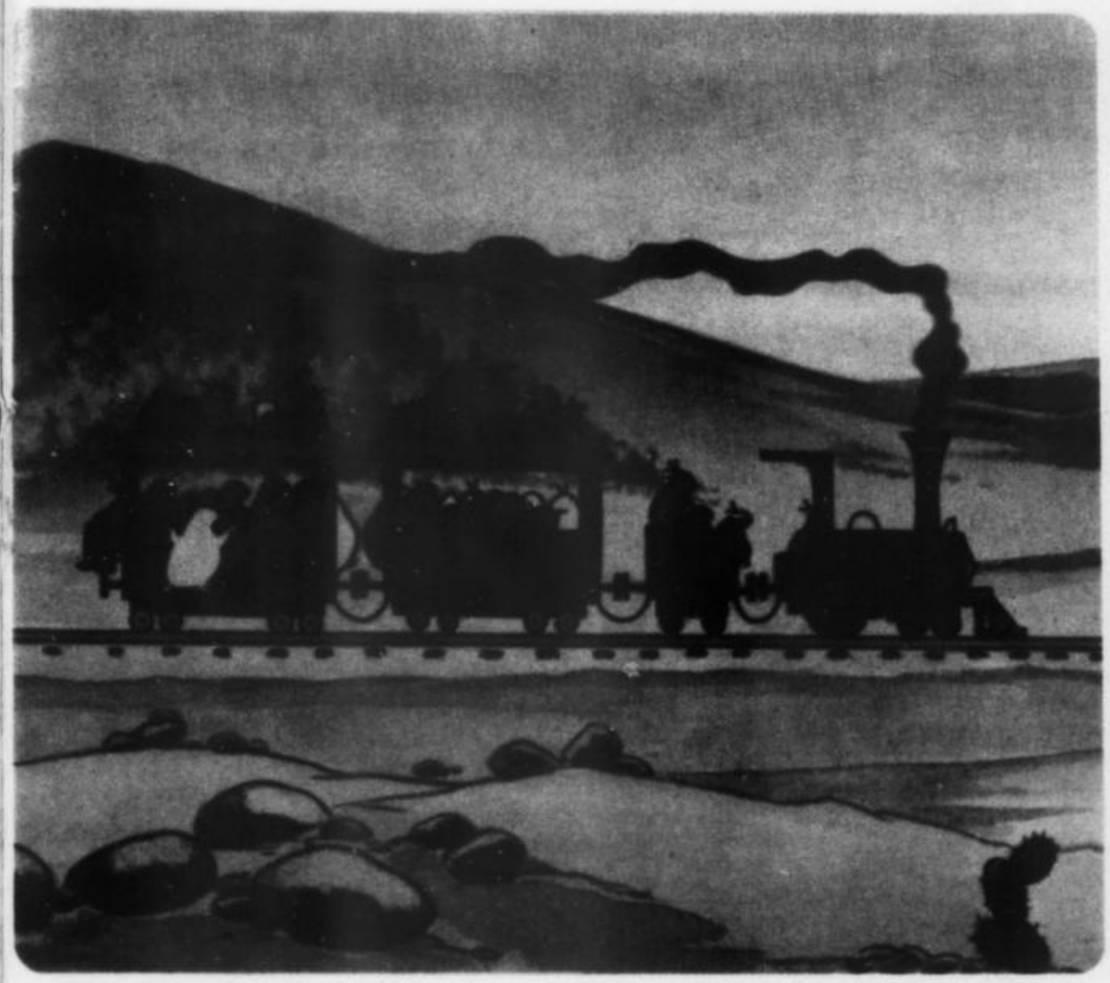
It could be, for many of us, if we don't plan well enough—and plan now—to provide the kinds of useful work that will be needed by the hundreds of millions of new job-seekers.

EDUCATION—FOR WHAT?

Even many people with a good education have a hard time finding work.
University and high school graduates often discover that the kind of work they seek is simply not available.

MAN VERSUS MACHINES ?

We need machines for many kinds of tasks, of course; but somehow we must also find work for idle hands. One way is to let human hands do the work in place of machines — when this makes economic and social sense.



JOURNEY OF HOPE

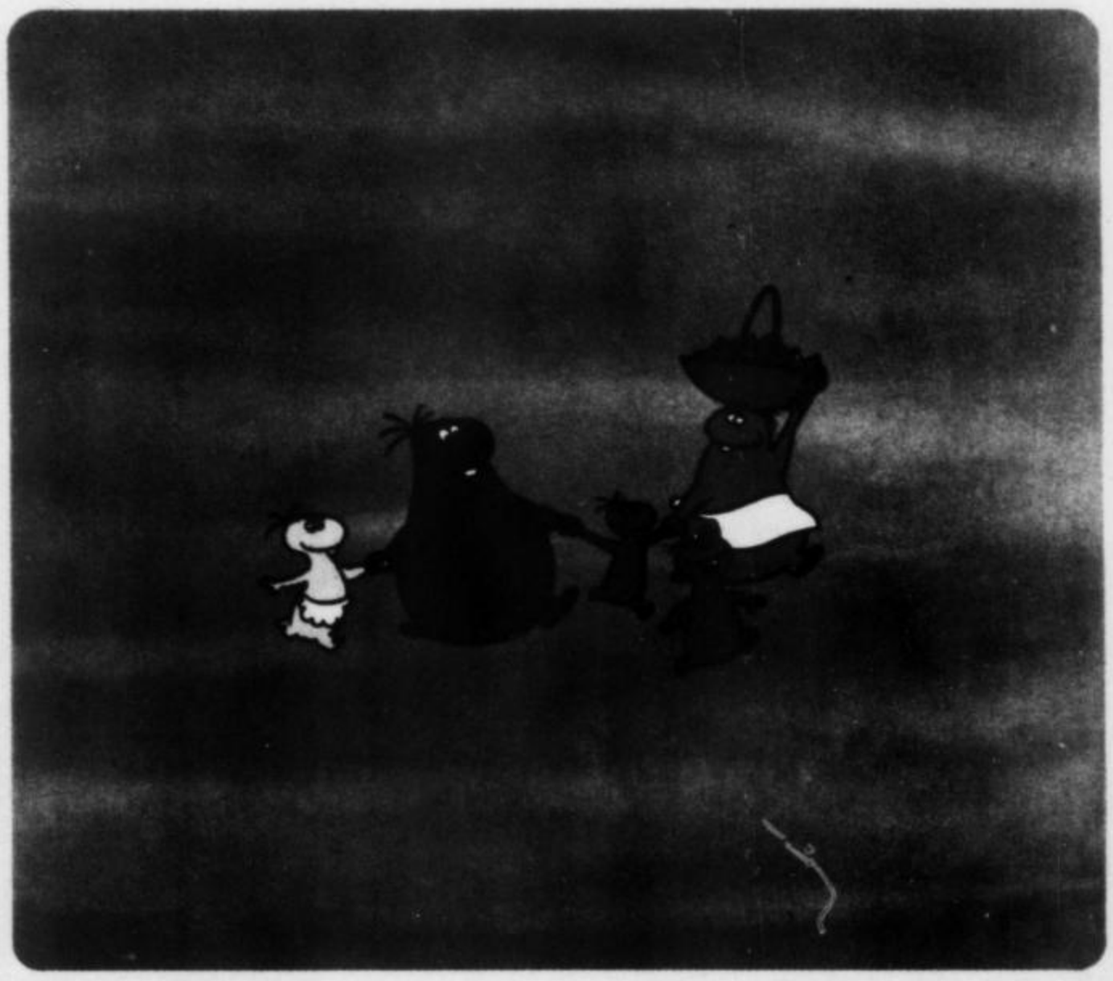
In search of a better life, many people leave the countryside, heading for the city where—they hope—they may be able to find work.

A VICIOUS CIRCLE

Too often the people who come to the cities have had no training. Many of them would have been better off if they had remained in the countryside, as many cities—especially in the developing countries—are already overcrowded.

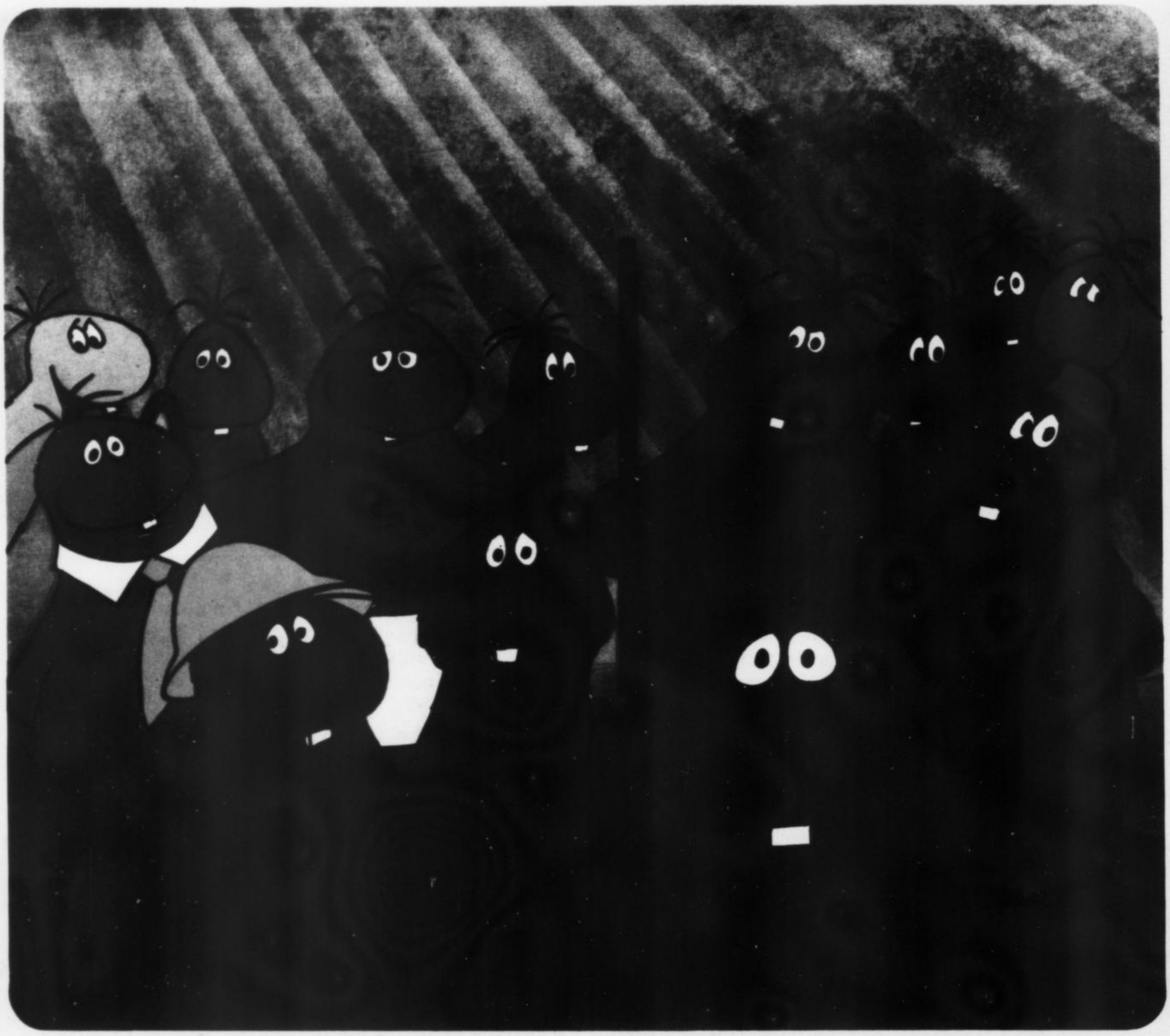
TRAINING FOR REALITY

Young people should be trained for the kind of work that needs to be done and that contributes to the country's economic and social development.



THE BALANCED LIFE

With productive jobs and a decent income, families often have fewer children, ensuring a better life for themselves and a more promising future for the youngsters.



THE ROAD AHEAD

To achieve a better life for mankind requires co-operation—between people and their communities, communities and national governments, governments and international agencies. In its World Employment Programme the International Labour Organisation is trying to help governments give reality to a right that belongs to all—the right to work and to provide a decent life for ourselves, our families and the generations to come.

EXODUS TO THE CITY

The problem begins where?

by Ashish Bose

THE crisis of human settlement is no less acute than the crisis of population explosion and the need for controlling human settlement is at least as great as that for controlling population growth rates. And yet in the massive literature on population, the attention given to the settlement pattern is utterly inadequate.

Demographers have usually relied on geographers to study the subject. Of late, however, because of rapid urbanization, increasing rural-urban migration and the consequent ecological problems, demographers have been forced to devote more attention to urban growth, internal migration and population redistribution.

But the perception of the problem of settlement is still heavily biased by an almost exclusive concern for the metropolitan areas and big cities. It is still rare to find demographers studying the settlement pattern from the rural angle in spite of the obvious fact that the great majority of the countries are predominantly rural and most of them will continue to be so even at the end of this century.

ASHISH BOSE, *of India, is professor at the Demographic Research Centre, Institute of Economic Growth, in Delhi, and Secretary-General of the Indian Association for the Study of Population. A specialist on questions of urban growth, he is the author of "Studies in India's Urbanization (1901-1971)", published in 1972, and editor of several demographic studies of which the latest is "Population in India's Development, 1947-2000".*

Photo © CIRIC, Geneva

The growing concern for environment has introduced a new dimension to demographic studies, and for that matter, to all studies. It cannot be denied that some of the environmental problems are most acute in the big cities, but the obsession with pollution problems in big cities tends to underestimate the urgency of environmental problems like floods, deforestation, soil erosion, primitive sanitary conditions, and a host of allied problems in rural areas. This gives rise to the tendency of most people to equate environmental problems with pollution problems of big cities. And yet the majority of the world population lives in rural areas afflicted by serious environmental problems.

One of the pioneering studies on environment—*Only One Earth* by Barbara Ward and René Dubos—begins the chapter on "Problems of human settlements" as follows: "The first need is to take the strain off existing cities", and proceeds to give some figures indicating the deplorable housing condition in Indian cities. But one could argue with equal force that "the first need is to take the strain off rural areas—the strain of poverty, unemployment and economic and social stagnation." One could also give figures for the deplorable state of the productive base of the rural economy in countries like India.

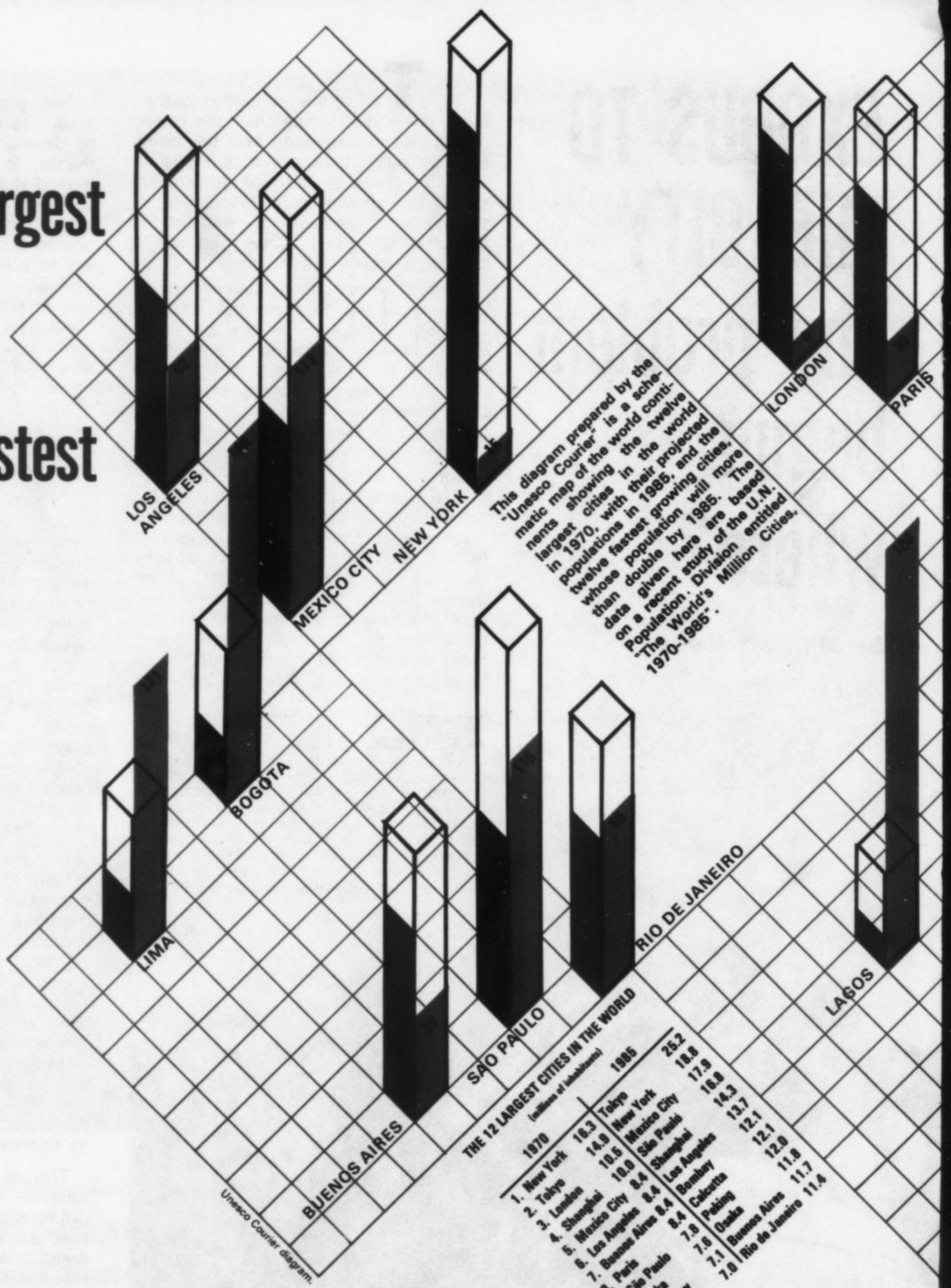
An overemphasis on the problems of big cities created by "the human avalanche" of migration, to use the picturesque phrase of Ward and Dubos, underestimates the positive role of migration in relieving rural poverty. There is inadequate realization of the role of cities as reception centres for the rural poor in countries like India. The tendency to look upon rural-urban migration as a nuisance and urbanization as an evil and to dream of pure air and the picturesque landscape in the countryside is to shut one's eyes to economic reality.

This is not to deny the urgency of positive measures to regulate rural-urban migration. But the popular view that as rural to urban migration is creating serious problems, such migration should be curbed, is an over-simplification. One should ask: Serious problems for whom? Certainly not for the rural migrant in spite of all the hostilities of the urban environment. In fact, rural poverty and unemployment drive the migrant to the city.

Can one look upon the cities as the exclusive preserve of only those who are already there and ask for an internal passport system in the name of orderly urban development? As a recent study of poverty in India points out: "Urban poverty is an outflow of rural poverty. Hence action against poverty has to be initiated in the rural areas."

It is important to realize that the success of urbanization policies in developing countries depends to a ▶

The world's largest cities and the world's fastest growing cities

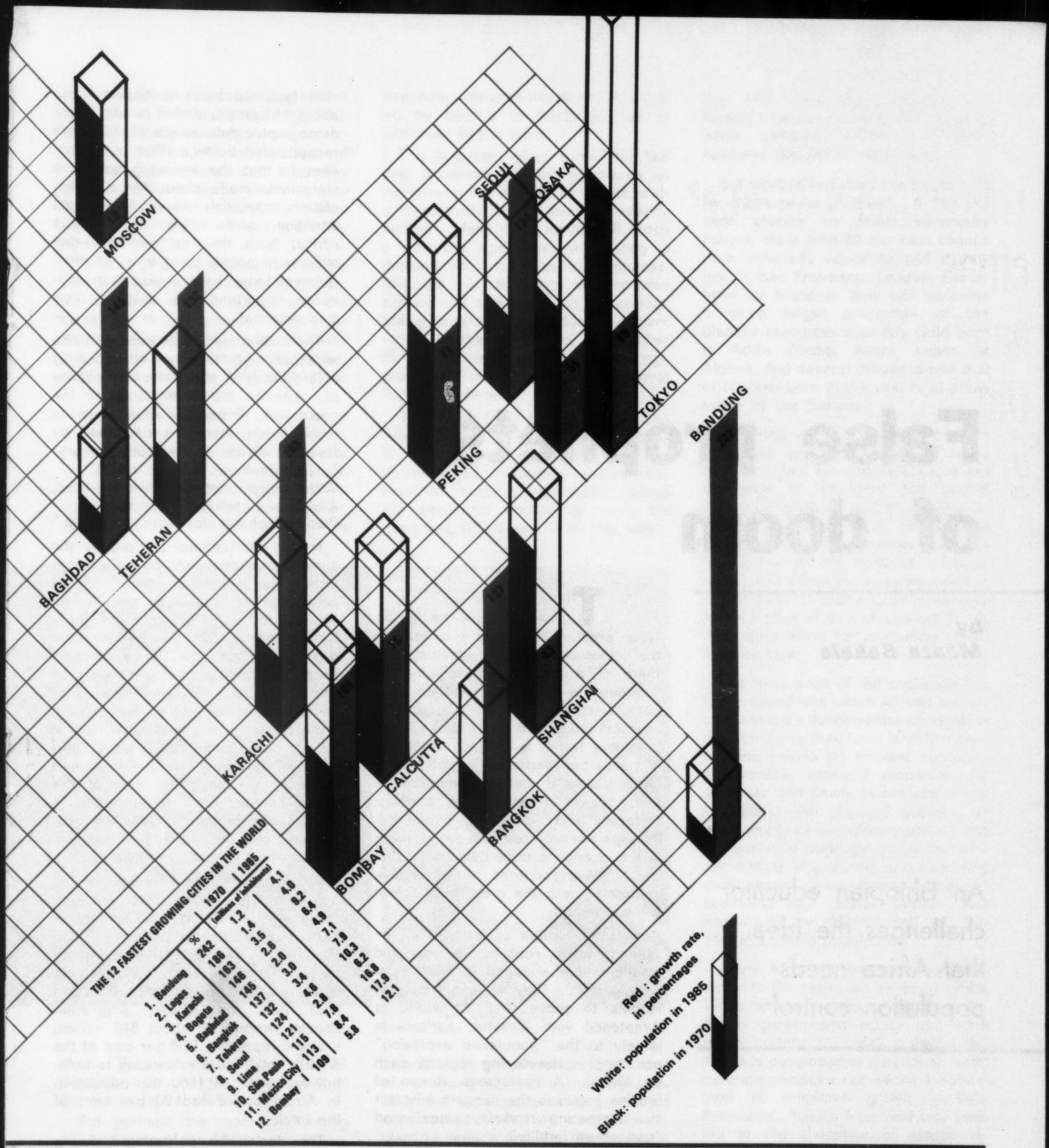


considerable extent on the success of modernization of agriculture and transformation of rural areas. Under conditions of rapid population growth and agricultural stagnation, the flow of migration from rural to urban areas cannot be stemmed merely by restrictive policies. The best deterrent to migration in such a situation is accelerated rural development.

Gunnar Myrdal has discussed the problem of agricultural development at length in his *Asian Drama*. Analyzing the main difficulties involved in formulating policies in South Asia, he refers to the urgency of making greater use of a labour force—today largely underutilized and rapidly increasing in size—if a much higher volume of aggregate output is to be achieved.

A common feature of developing countries in Asia is the excessive dependence on agriculture, and one of the primary objectives of development planning is to reduce this dependence and to evolve a more diversified occupational structure. However, both on account of excessive population growth and the colonial background and related factors, there has been a structural stagnation in these countries.

The population problem cannot be viewed merely in terms of an accelerating growth rate on account of a persistently high birth-rate and a rapidly declining death-rate. The population problem in the developing countries of Asia is much more a problem of structural stagnation on account of a persistently high proportion of the working force having to depend on traditional agriculture.



Considered from this viewpoint, improvement in agricultural technology and the modernization of agriculture will have a bearing not only on agricultural productivity but will also release forces of modernization which will affect the attitude towards family size.

It is curious that in the massive discussions on the population problem in recent years so little has been said about the relevance of land reforms. Once we look upon the population problem as a problem of structural stagnation, any measure which can break this stagnation should be considered as a development measure.

Further, if such a measure encourages occupational mobility, it is directly relevant to family planning in terms of a higher motivation to practise family planning.

To the extent that land reforms succeed in giving land to landless agricultural workers, they generate occupational mobility and can therefore be considered as both a developmental measure and a fertility influencing measure.

In any case, in countries where a predominant majority of the population depends on agriculture and the major share of the national income is derived from agriculture, it is natural that any demographic policy which seeks to influence fertility behaviour must take note of this basic economic reality. Unless the social and economic life of the rural masses is touched by our policy measures, economic and social stagnation cannot be broken. ■

Ashish Bose

False prophets of doom

by
Maaza Bekele

An Ethiopian educator challenges the idea that Africa needs population control

TO write about the "population problem" in Africa is to fall into the convenient trap of admitting that there is a problem caused by the existence in Africa of a certain number of people with certain demographic characteristics. To write about Africa in global terms is also to deny the fact that this particular region of the Third World is not a homogeneous unit, but is a mosaic of peoples, cultures and differing conditions. Perhaps the only common denominator is the economic underdevelopment of the different countries of the region, contrasted with the great potential of a great people.

In many centres of learning in the Western world, sophisticated men and machines are engaged in the "numbers game". They work out elegant models to prove that the world is threatened with disaster, attributable largely to the "population explosion" occurring in developing regions such as Africa. A continuous stream of articles points to the dangers inherent in "decreasing mortality rates" and "unchecked fertility".

But it is encouraging to note that some scholars question the value of this "numbers game". John Maddox, in his book "The Doomsday Syndrome", lodges a "complaint" against the prophets of doom and their hysterical pronouncements. David Eversley, himself engaged in demographic research, has the humility to admit that nearly all the "theories" put forward so far by demographers can be exploded. None can encompass the complexity of human behaviour and the reproduction of the species.

In fact, not much is known today about African population trends. Such demographic data as are available are recapitulated below. What is of concern is that the recurring explosive statements made about Africa's population may only serve to distract attention, both within and without Africa, from the real problem—that millions of people living in a rich environment today have a less than adequate opportunity to develop their true potential.

The demographic data base in Africa is exceedingly tenuous, consequently it is difficult to state with any degree of certainty the exact size of the population. Today, the situation is not much better than that described by Jonathan Swift in the 18th century:

"... Geographers, in Afric maps,
With savage pictures fill their gaps,
And, o'er unhabitable downs
Place elephants for want of towns."

In two publications put out by the same organization, at about the same time, the estimated total African population is stated in one to be 363 million in 1970, and in the other 338 million in 1971. A 2.8 per cent growth rate per annum, assumed in another publication, gives us the total of 329 million in 1970—a difference of 34 million for the same year. Crude projections to the year 2000 on a 2.8 per cent growth rate, yield a difference of 76 million souls, (which was close to the estimated size of the entire Eastern African sub-region in 1970). One need hardly stress how dangerous it could be to play the "numbers game" with this quality of data.

If we assume that the size of the population lies somewhere between these estimates, say, 350 million in 1970, this represents between 9 and 10 per cent of the total world population occupying just over 20 per cent of the earth's land surface. If by the year 2000 the African population should increase to about 818 million, it would represent 12.6 per cent of the world's total. It is interesting to note, however, that in 1650 the population in Africa constituted 20 per cent of the total.

The decimation perpetrated during the slave trade in the 17th and 18th centuries, military engagements which attempted to ward off impending colonization in the 19th century, the subsequent exploitation of African labour, the introduction of new diseases from Europe and the spread of locally endemic diseases through the migration set in motion at that time, all contributed to an absolute decline in the number of African people over a period of 200 years. Thus, the percentage relative to the rest of the world was quite dramatically lowered.

MAAZA BEKELE *is head of the Social Services Department in Ethiopia's Planning Commission Office, and has taught at the Haile Selassie University in Addis Ababa. Her article is an edited and abridged version of a study she presented last May at an African seminar on population and economic development, held in Dar es Salam (Tanzania), under the auspices of the World University Service. The study has also been published by "Ceres", FAO Review on Development, Rome.*

It is only since the beginning of this century that the rebuilding of the African population has begun.

Today, Africa is constituted of 41 independent states and a number of colonial territories. There is also South Africa with almost 23 million people, one fifth of whom are a white racist minority.

In 1970, of the 41 independent states, only 9 had a population over 10 million; 13 had less than 2 million and the remaining 19 had a median population of about 4 million. Only Egypt, Ethiopia, Nigeria and Zaire can be considered large countries with populations in excess of 20 million.

Population densities as compared to the rest of the world are low, averaging 11 persons per square kilometre in 1968 as against the world average of 26. A more useful measure in African agricultural societies is, however, density per square kilometre of arable land. This was estimated to be 184 in 1968, a much lower average than the world figure of 248.

But perhaps the most challenging characteristic of the African population, as in the rest of the developing world, is the predominance of young people. Close to 44 per cent of Africa's population is under 15 years while less than 3 per cent is 65 and over.

The prophets of doom contend that both the structure and the consequent potential size of the African population (as one component of Third World potential), is a threat to general world prosperity and a deterrent to economic development in the African countries. They see an absolute decline in fertility as the only remedy to the impending disaster which will be caused by decline in mortality, due to improved health care.

The argument goes something like this: a decline in mortality means an increase in the number of infants, with a consequent rise in the dependency burden. Many more adults will reach a ripe old age, thereby creating a demand for more jobs and services. Pressure on the land will increase rapidly and there will not be enough arable land left to produce sufficient food. At the same time, the number of women in the reproductive age group will increase, with a potential impact on fertility.

This "high level of fertility", as the World Bank's Sector Working Paper on Population Planning puts it, "...can be expected to decline everywhere. However, cultural and social factors are significant enough to make for important differences in fertility levels among areas of the world. In the face of continuing success in reducing mortality, no developing country has yet experienced a fertility decline sufficient to reduce the rate of population growth to the average level of 1 per cent per annum characteristic of the developed economies of Europe, North America and Japan. Falling fertility is the only factor that can accomplish such a reduction—except, of course, a return to much higher mortality rates."

This one-dimensional approach invariably leads to pressure on African governments to adopt population control programmes as the panacea for their and the world's ills. It has also resulted in extremely simplistic statements and propaganda handouts which are often not politically sensitive, hinting in some cases at the threat to white children, which a growing coloured population represents.

But what in fact does the future hold for these white children? A 100 per cent chance to finish secondary school; more than 50 per cent chance of a university education and if they live in San Francisco, London, Stockholm, or Moscow, they will consume a much larger proportion of the planet's resources than any child born in Addis Ababa, Accra, Lagos or Algiers, and several thousand-fold that of children born in the vast rural areas south of the Sahara.

In Africa we cannot afford to look upon our growing population as a problem. We have to face up to the challenge of engaging our young, expectant peoples in the struggle to achieve the most rapid development possible, while ensuring an equitable distribution of the fruits of development. And Africa must accomplish this in the face of tremendous pressures and the general lack of concern in the developed world for promoting global development.

The focal point of the challenge lies in the speed with which African nations can introduce fundamental changes in the structures they have largely inherited and ensure (1) efficient allocation of available financial resources, (2) adequate and timely investment in the intellectual and physical potential of the majority of the African people, and (3) maximum participation by the African people in planning and executing development programmes within an economic and social system that appeals to the idealism and imagination of a young population.

Many African countries have fallen victim to the economic concepts of the 1950s which assume a dualism between growth and equity and have given priority to rapid growth. But Africa is composed of traditional, rural-agrarian societies not easily incorporated in simplistic growth models. Pressures, mainly from without, have led to the allocation of scarce resources to a largely artificial, modern industrial sector. This has caused increasing underemployment in rural areas, accompanied by rural-urban migration and a reduction in food supplies.

The modern sector, on the other hand, is not creating jobs fast enough to absorb displaced labour. Hence an increase in overt unemployment in many African cities, particularly among school leavers whose western-biased education has led them to expect jobs which the system just cannot provide.

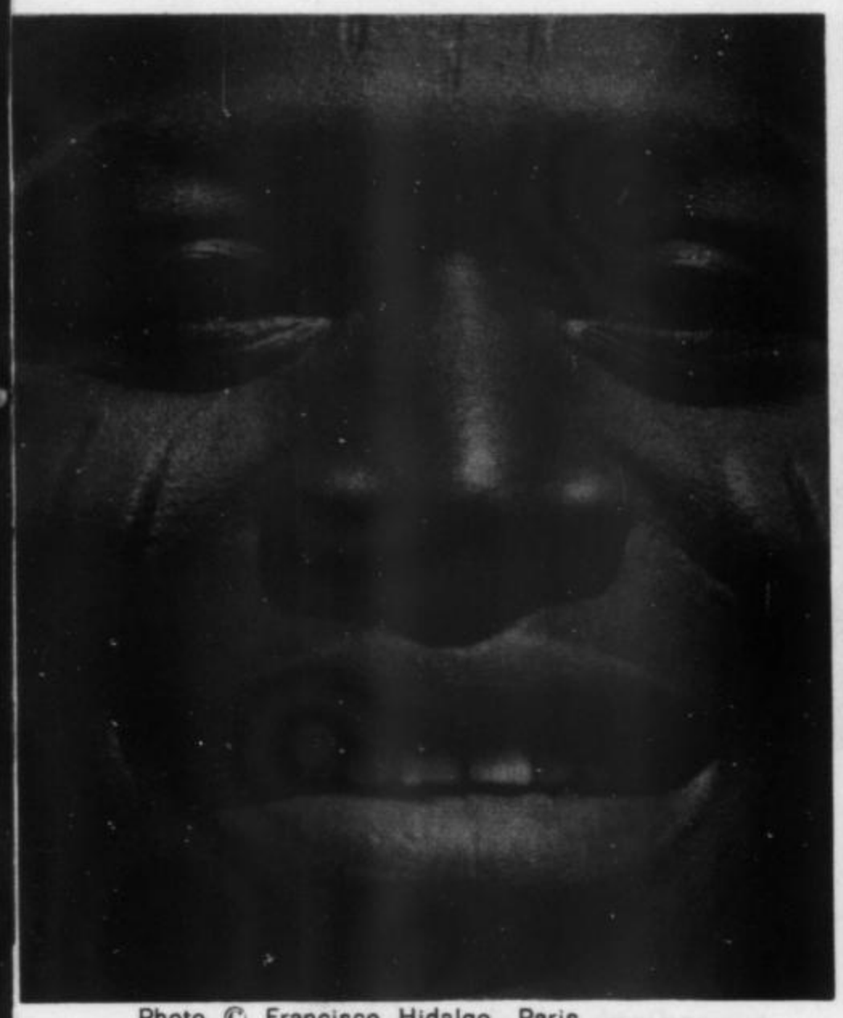


Photo © Francisco Hidalgo, Paris

Photo © Paul Almasy, Paris

" Population densities in Africa as compared to the rest of the world are low, averaging 11 persons per square kilometre in 1968 as against the world average of 26. "

It is open to question whether the growing employment problem in Africa is primarily a product of population growth, or can be attributed to the allocation of resources away from rural agricultural development, the greatest overall potential in Africa.

Africa's economic development has and continues to be dictated largely by the world economic structure. Trade relations are distorted and the production process in most African countries is not geared to meeting African needs but must of necessity be oriented to the export sector from which much-needed foreign exchange is obtained. Many African countries have become overdependent on one crop—coffee in East and West Africa, cocoa in Ghana, groundnuts in Senegal, and so on.

Despite the efforts of the U.N. Conference on Trade and Development, the developed world has not yet responded to the challenge of changing its structure of production so as to absorb the products of developing countries. In Africa therefore we can only continue to press for the required changes in trade relations between rich and poor countries. But the new move in Africa is much more important—a move toward economic co-operation between and among African nations, which together can provide a market large enough to admit of viable trade.

Within African states also is the further move toward fundamental restructuring of economic and social development, based on Africa's agricultural potential. Physical and social infrastructure, including marketing arrangements, must be built up; institutional reforms, particularly land reform and settlement, must be carried out; technology suited to the African reality—smallholder agriculture—must be developed, and policies pursued which will ensure that the private cost of capital does not cheapen the price of labour, available in abundance all over Africa.

Timely intervention and investment in critical areas such as the Sahel belt will forestall disaster in drought-threatened areas south of the Sahara. Thus investment in agriculture will not only build up Africa's economic base and absorb its labour force, it will also provide the food required by Africa's growing population.

Given its existing structure and the "bulge" that could accompany even a small improvement in nutrition and general living standards, a doubling of the population in many African countries by the turn of the century may be inevitable. This is the eventuality Ethiopia for instance faces. The first priority must therefore be to meet the needs of this increasing population. Children and adults must be educated and services provided. The capacity to cope with life today and in the 21st century must be built up in the citizens of Africa.

Both financial resources and trained manpower are in short supply in most African countries. This is why many governments are searching for new and more imaginative approaches which will permit them to offer the largest majority of children and illiterate adults the opportunity to acquire basic education and the skills required to promote development in rural agrarian economies. The bold experiment in Tanzania is a case in point. Ethiopia's recent Education Sector Review also indicates that it is possible within available resources to achieve this goal in 10-15 years.

The physical capacity of the African people must also be built up through improvement in the general levels of health and a better standard and quality of life. Today, average life expectancy in Africa is only 40 years. Infant mortality rates are astronomical —over 150 per 1,000 live births in 14 out of 25 countries. There is an exceedingly high death-rate among children under 5 years. The advocates of population control argue that family planning will result in lower infant mortality and child deaths. Almost unlimited funds are made available for family planning programmes, but they are often withheld where no official programme exists.

It seems almost sinister that there is so much money available to *control* life and hardly any to *promote* it.

It also seems unrealistic to expect that poverty-stricken, hard-working African mothers—many close to death before the age of 35—can be expected to limit the number of their children when only 1 out of 3 or 4 survive. The onus is on the "controllers" to demonstrate to these women that 3 out of 4 of their children *will* survive.

They cannot run the risk that their major creative contribution to humanity (given that the rest of their existence is almost pure drudgery), will be denied them. In each woman is the grain of hope that life for her offspring will be better than hers.

Besides, in African society, procreation and the loving, tender rearing of children is one of society's most important goals. Children are not a burden, they are an asset in the average farm family.

It is little wonder therefore that family planning programmes have so far had little success in Africa. Only 8 African countries—Botswana, Egypt, Ghana, Kenya, Mauritius, Morocco, Nigeria and Tunisia—have officially instituted family planning programmes. By and large these are mainly concentrated in the urban areas where fertility levels are already lower than in rural areas, and only a minuscule portion of all women in these countries is being reached. Little attention is paid to evaluating either the impact or the cost of these programmes.

One attempt at evaluation is Lars Bondestam's report on "Population Growth Control in Kenya". This study indicates that it is mainly women who have a comparatively high standard of living who are involved in the family planning programme. Only the educated among them tend to start contraception early in their child-bearing period. Only about half of the acceptors remain in the programme after one year, and a sizeable proportion of these are women who have few or no children. Bondestam also contends that the cost of the programme, now in its fifth year, is exceedingly high compared to other countries. There were some 8,000 births prevented in 1969/1970 at a unit cost of about U.S. $155.

The view is widely held in Africa that until a greater proportion of children are able to stay alive, large numbers will continue to be born. An increase in the survival rate will, however, depend on two factors—the rate at which the level of health of the majority of the African people can be improved, and a steady and perceptible rise in the standard and quality of their lives.

The road to economic development in the 1970s is being charted. This development can make it possible to offer to the majority of African villagers and the urban poor a simple package of health promoting services —a package which costs very much less than elaborate hospital services available in the African metropolis.

Perhaps the greatest challenge that Africa faces is that of mobilizing the hearts and minds of the mass of African people in the development effort, releasing their latent energies so that they themselves will take the challenge of developing their land to its full potential. This means more involvement of local communities and the African youth in the decision-making process and in the implementation of programmes which benefit the majority by providing productive employment.

Traditional organizations in Africa must be adapted to meet this need. African women must be given a real stake in producing and reaping the fruits of development. It may even be so that in cities like Lagos and Accra, Cairo, Nairobi and Addis Ababa, the emerging role of women in today's social and economic activities has begun to affect both productivity and fertility trends.

The only evidence we have in human history of "population stabilization", or reduced population growth, is the experience of the now developed countries that decline in fertility is a function of prosperity. There is no reason to expect underdeveloped Africa to follow a different path. ■

Maaza Bekele

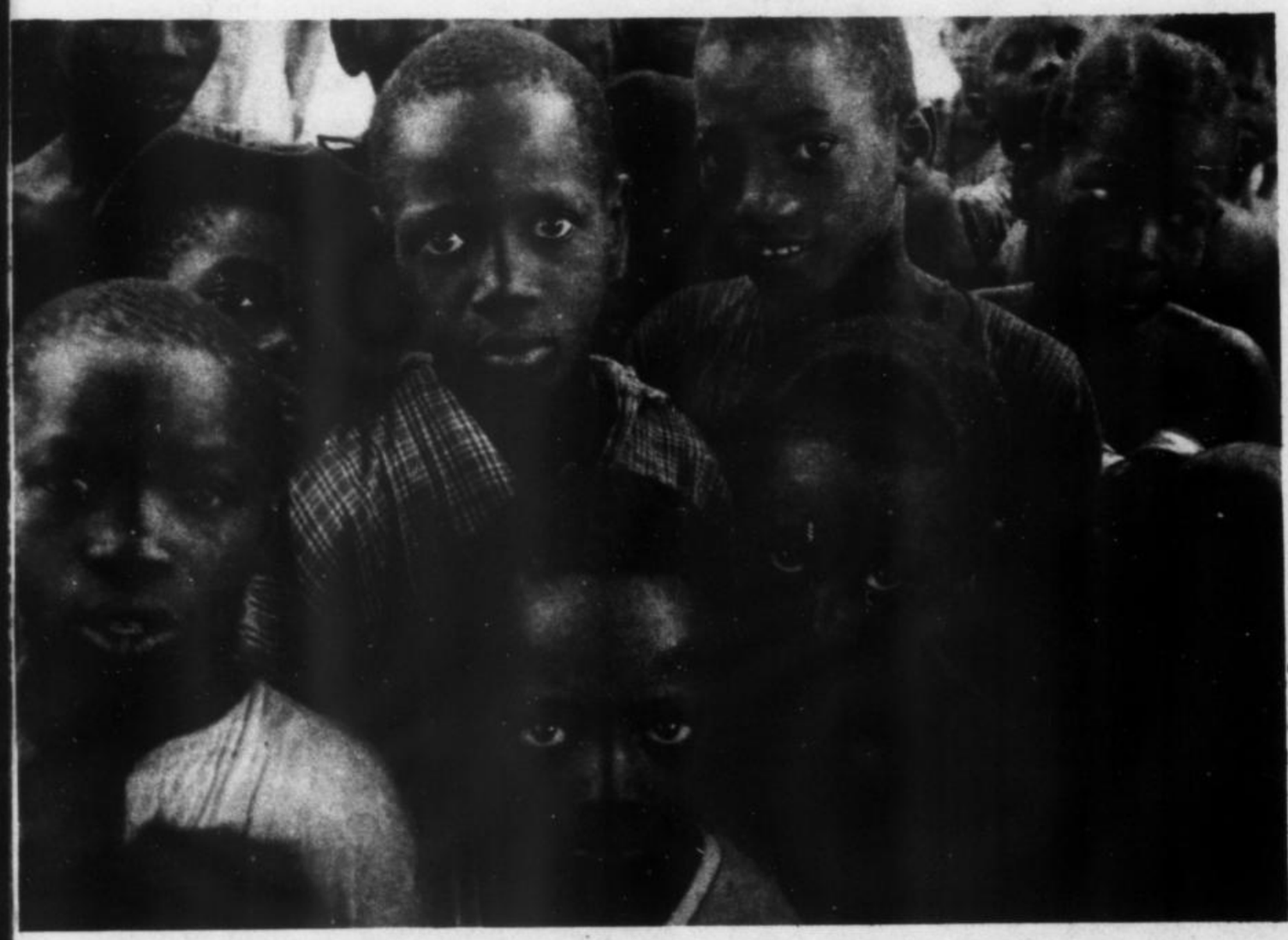
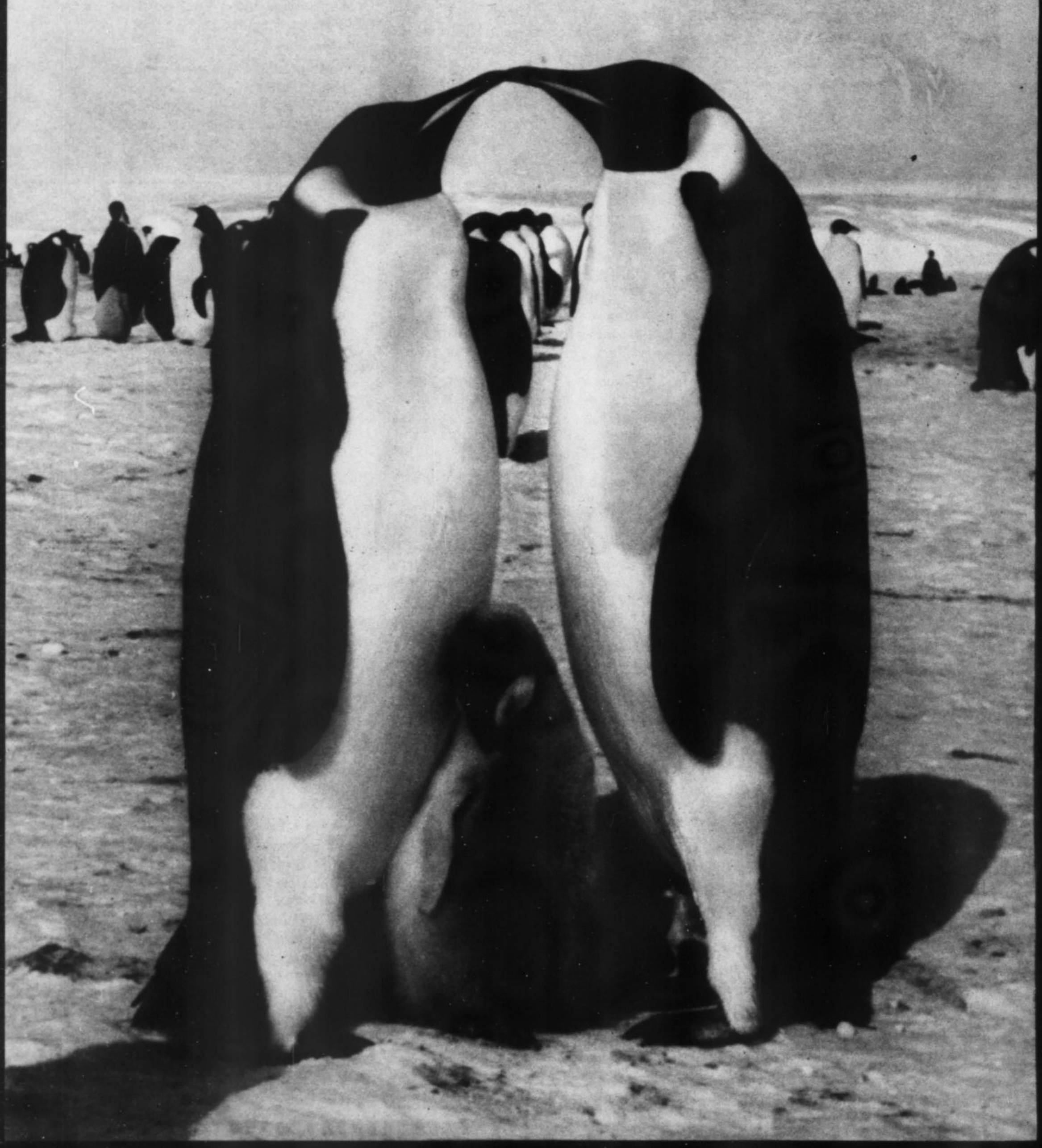


Photo Unesco - P.A. Pittet

" The prophets of doom contend that both the structure and potential size of Africa's population is a threat to world prosperity and a deterrent to economic development in Africa. This is a one-dimensional approach. In Africa we cannot afford to look upon our growing population as a problem. We have to face up to the challenge of engaging our youth in the struggle to achieve the most rapid development possible. Africa must accomplish this in the face of tremendous pressures. "

FAMILY PLANNING



A UNITED NATIONS WORLD SURVEY

EARLY this year the United Nations published a report on a second world inquiry into population and development. Carried out by the U.N. Economic and Social Council with the governments of 80 countries, the inquiry covered many aspects of the population question.

In its May 1974 issue, the "Unesco Courier" presented the findings of the survey with respect to government attitudes and policies towards population. In this issue we publish its conclusions with respect to the provision of family planning facilities.

"Family planning activities organized, sponsored or permitted by governments are spreading throughout the world", the U.N. report says, "even in those countries where no explicit population policy has been adopted or where pronatalist objectives are being pursued." In many countries such services are made available in the interests of mothers' and children's health, sometimes on a state basis, sometimes through clinics operated by voluntary bodies.

The U.N. report describes the countries covered by the survey as falling into four distinct categories where family planning is concerned:

1. Countries where governments organize or actively sponsor broad national family planning programmes, including countries where such activities are foreseen for the near future;

2. Countries where the population is practising birth control with the assistance of private, non-governmental bodies;

3. Countries where family planning is not officially endorsed or assisted, or where it is even forbidden;

4. Countries where no information is available on family planning.

The U.N. report summarizes its findings on family planning in the major regions of the world as follows:

Africa

Egypt, Kenya and Tunisia have well advanced national family planning programmes and are making further efforts to improve these activities. The Government of Swaziland stated that family planning advice will increasingly become an integral part of the basic health services. Madagascar is considering undertaking a pilot study in family planning. The U.N. Economic Commission for Africa reports that Tanzania officially accepts family planning services offered by a private association but has no official national programme of its own.

Gabon is totally against any form of family planning measures because of its low fertility and is the only country in Africa where the sale of contraceptives is an offence. In Malawi family planning has not, so far, been officially endorsed as a national policy. Zambia too has no specific official policy of family planning.

Information available to the Economic Commission for Africa shows that to date eight countries with about 24.5 per cent of Africa's population have official family planning programmes while 13 other countries with 48 per cent of the region's total population, though having no official programmes, have programmes run by voluntary associations, some of which receive government support. There are, on the other hand, some 21 countries with 27 per cent of Africa's total population which are at present either not interested in or are opposed to family planning programmes and, therefore, have no programmes at all.

Latin America

Countries of Latin America are also in a somewhat early stage of developing family planning activities. Barbados, Colombia, Panama and Trinidad and Tobago have national family planning programmes. In Mexico, family planning is understood as a social and medical service to which the whole population is entitled, especially those of lower income. (Further details on population questions in Latin America are given in a special article published on page 62.)

Asia

In the Asian continent, family planning programmes are widespread. Twelve countries, among them the most populous, have national programmes. China, India, Iran, Japan, Nepal, Pakistan, the Philippines, the Republic of Viet-Nam, Singapore, Sri Lanka, Thailand and Turkey have accumulated valuable experience, and achieved significant results in influencing fertility through family planning.

In Israel and to a less extent in the Khmer Republic, family planning services are provided by medical institutions but are not endorsed as an official government policy. They are not intended to reduce the birth-rate but serve the purposes of general welfare and responsible parenthood. In several other Asian countries, Bahrain, Jordan, Laos, and in the near future possibly also the Syrian Arab Republic, family planning is the work of the health and welfare administration.

In Iraq, the government is not expected to take measures in the near future to reduce the birth-rate.

Photo Y. Fedorov, APN, Paris

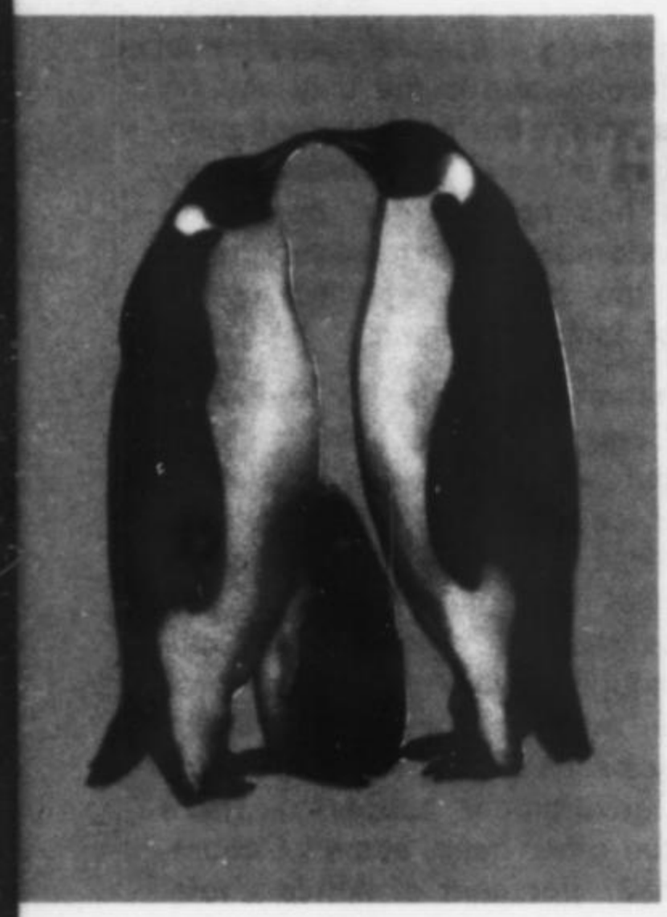


Photo Paolo Koch © Rapho, Paris

Above, family planning poster in Madras, India. The Tamil slogans read: "Two or three children are enough" and "Your doctor will advise you". The same poster in different languages is displayed in the other regions of India.

Europe

The European continent is in a different demographic situation from most other regions. Family planning services are promoted in many European countries and it is known that the population at large is availing itself of the existing contraceptive methods, medical advice and often also liberalized abortion laws.

Countries most closely concerned with family planning are the United Kingdom, Denmark, Netherlands, Yugoslavia and some eastern European socialist countries. In Romania family planning is approved by the government for reasons of family health and welfare with rather pronatalist general tendencies. Hungary is sympathetic to family planning services mainly as a means of avoiding induced abortions.

In most western European countries private family planning services exist within the general health and social welfare programmes, along with a widespread use of different contraceptive means and methods, and birth control is regarded as a strictly private matter. This is clearly the case in Sweden but can also be inferred in Austria, France, the Federal Republic of Germany, Finland and Norway.

The position of the Ukrainian S.S.R. and the Soviet Union is less clear. Family planning is officially not endorsed although contraceptive means and relevant medical and social services are widely available. Greece, Spain and Italy have no official or officially recognized private family planning services.

North America

In Canada the government's role is to encourage the development of family planning services and provide advice and assistance. The Canadian family planning programme was initiated in 1970.

The Federal Government and Congress of the United States support family planning programmes on the premise that the spacing and limitation of births strengthen the health of the mother, increase the integrity of the family and provide greater opportunities for the children.

Oceania

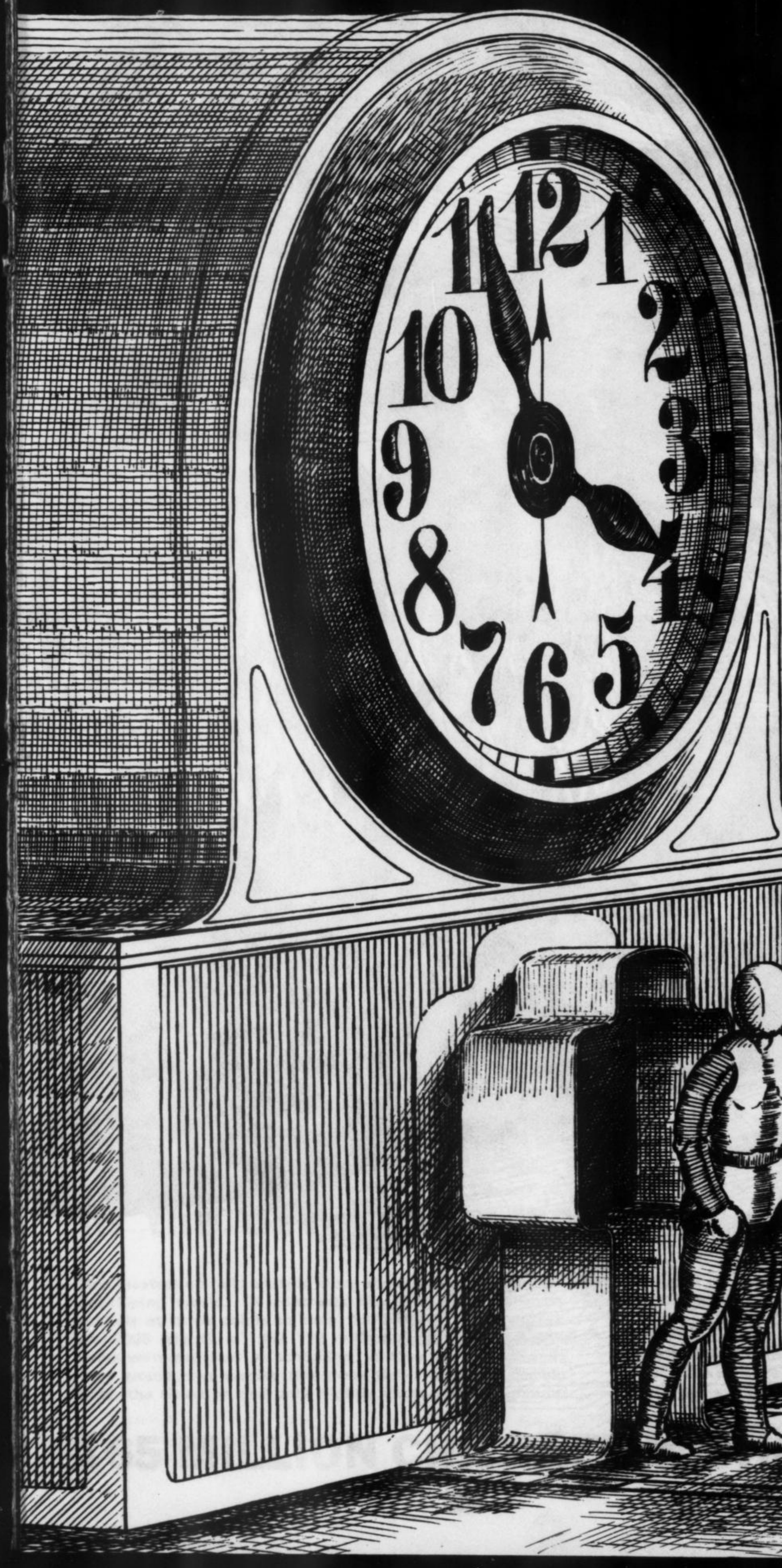
In Fiji a Government family planning programme has been operative for several years. New Zealand did not have an official national family planning programme until 1971 when the Government decided to introduce one and to extend the activities it had hitherto been supporting in this field.

In Australia, there are no official family planning activities and advertising of contraceptives is prohibited, but family planning services are expected to attract more government support in the years to come.

In conclusion, the U.N. Report makes two general observations:

The most advanced family planning activities organized by government agencies are in Asia and North Africa. On the other hand Europe and North America are the continents where family planning appears to be most widely practised by the population even though these measures do not usually form part of government policy.

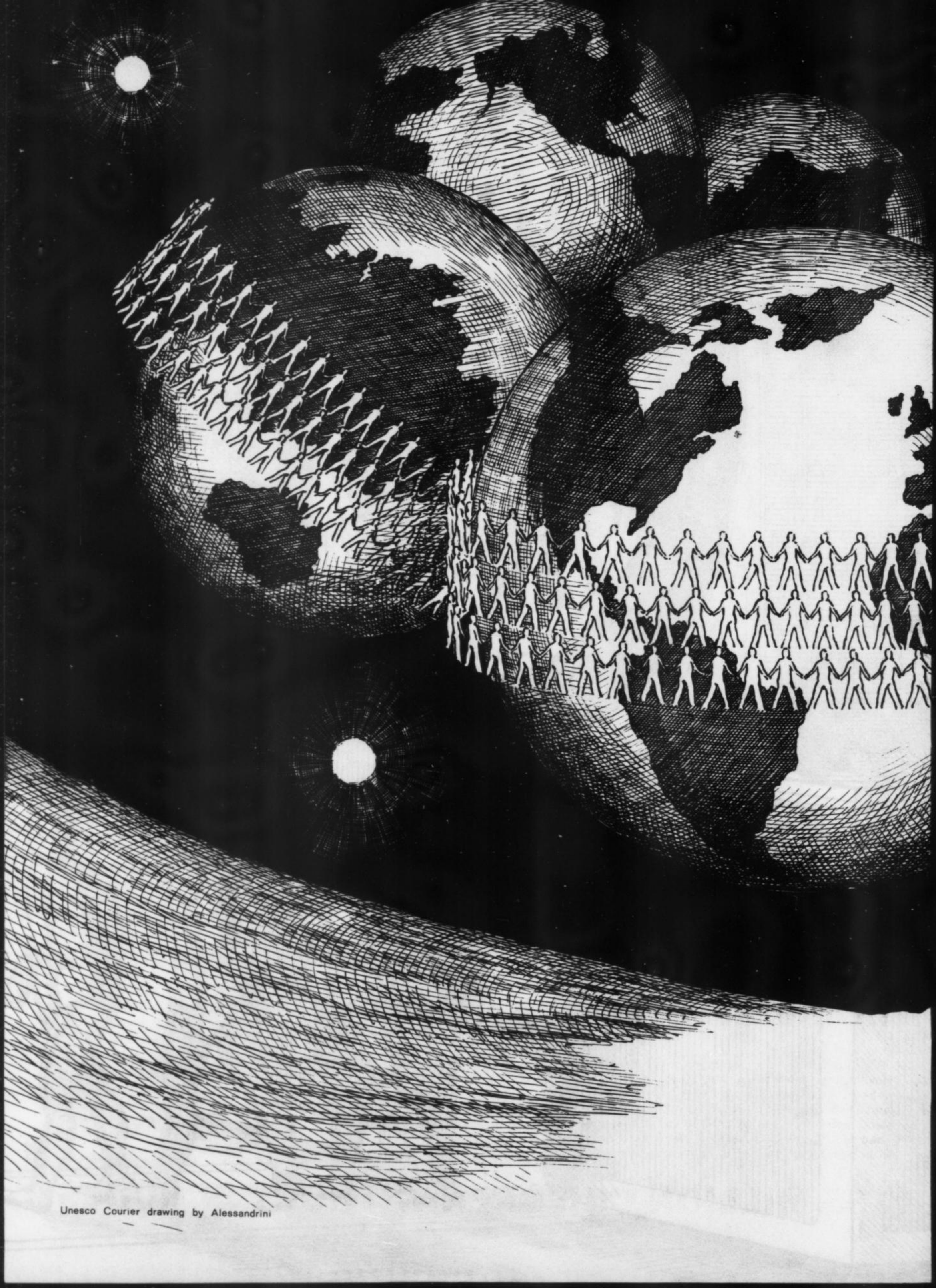
The situation in the countries surveyed clearly indicates a tendency toward the spreading and improvement of family planning activities and their development as an integral part of health and welfare programmes. ■



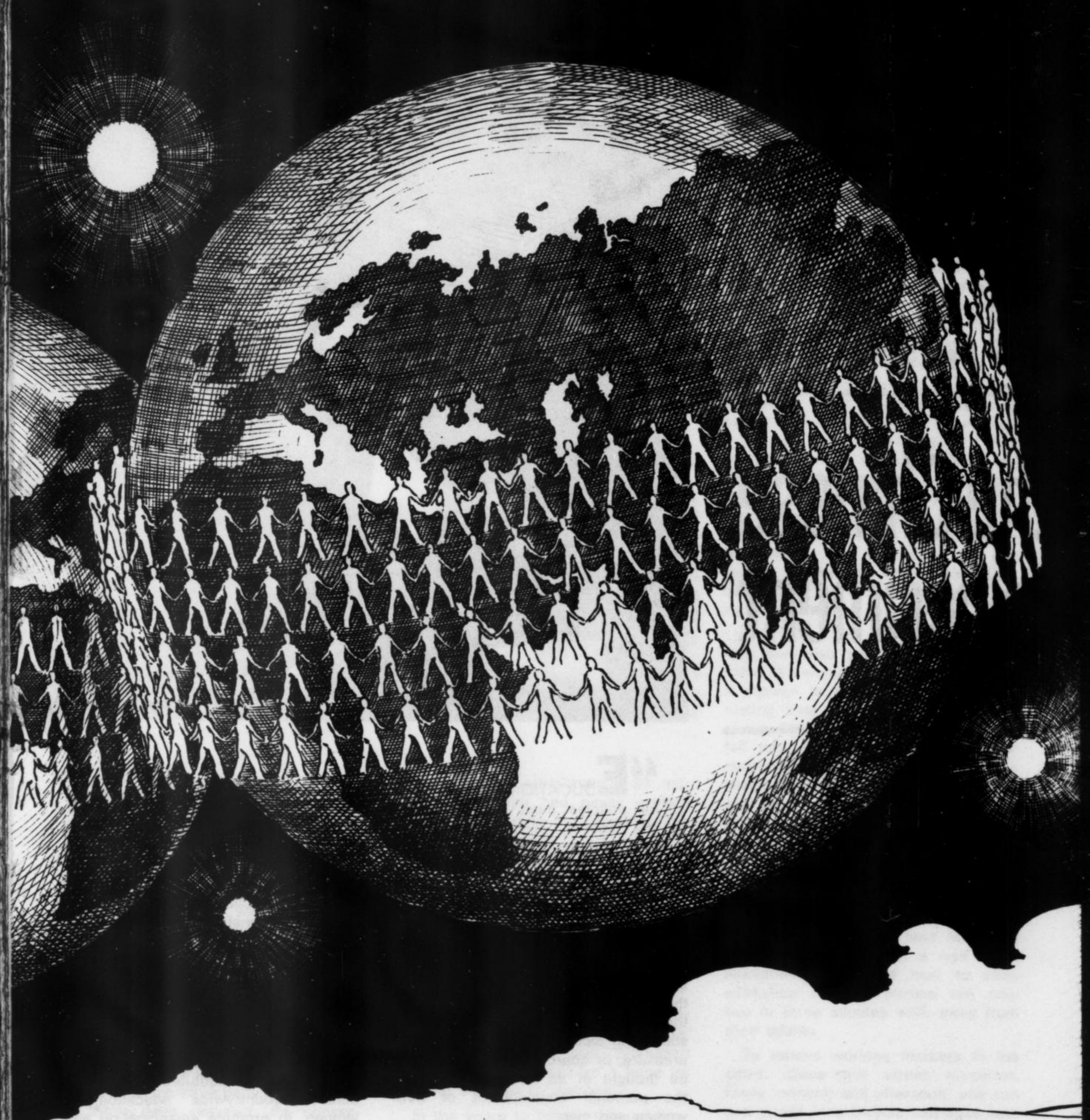
In the developing world ONE NEW TEACHER NEEDED EVERY MINUTE

Between 1970 and 1985, the developing regions will need more than 7 million new primary school teachers. It is estimated that 273 million children will be attending primary school in these regions in 1985—over 100 million more than in 1970. This means that more than half a million new teachers must be found every year; more than 1,300 every day; 57 every hour, or one new teacher every minute. These figures are based on the assumption that the developing regions will increase their enrolment during this period at the same annual rate as during the last decade, and are taken from a new Unesco study, "Educational Development. World and Regional Statistical Trends and Projections until 1985," prepared by the Office of Statistics for the World Population Conference in Bucharest in August 1974

Unesco Courier drawing by Alessandrini



Unesco Courier drawing by Alessandrini



In the developing world

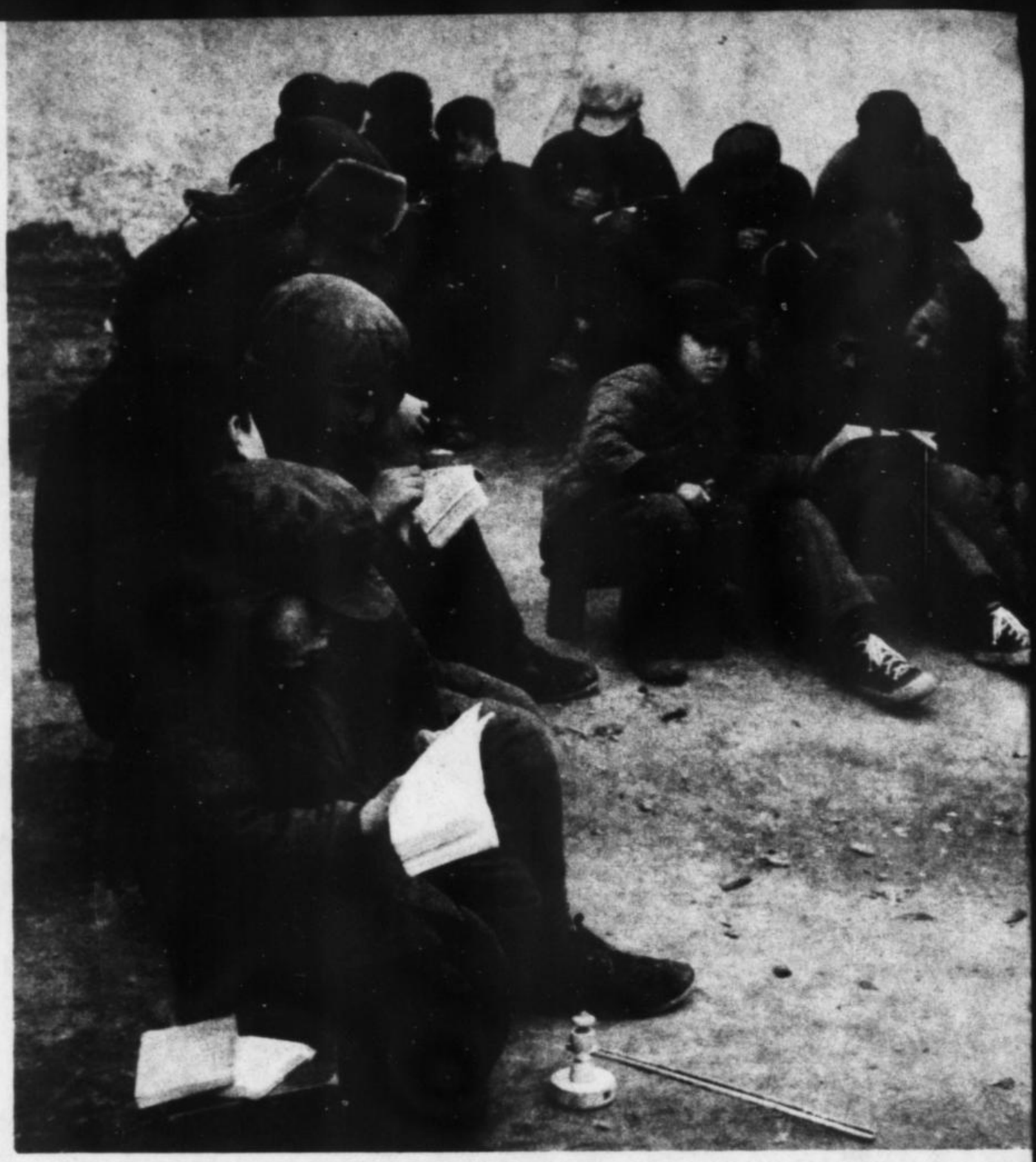
This illustration tells a tragic story about the children of the developing world. It contrasts the shortage of primary schools at three points in time: 1970 (left), 1960 (centre), and 1985 (right). In 1960, 118 million children aged 6 - 11 years were deprived of schooling; if they had linked hands they would have circled the globe three times. A decade later, the situation had only slightly improved : 113 million children in the same age group were without schools. However, if educational trends during the last decade continue, by 1985 population growth will be such that 165 million children in the developing regions—more than one child in three in the primary school age group—will not be enrolled in school. If they were to join hands these children would be able to circle the globe four times.

165 MILLION CHILDREN WITHOUT SCHOOLS

FAMILY
PLANNING

by Han Suyin

the Chinese experiment



Text Copyright ©
Unicef and Han Suyin
Reproduction prohibited

"EDUCATION is the key."

"All policies must be understood by the masses, carried out by the masses, and be in their interest."

In these two sentences, we find the clue to understanding family planning in China. For it is through a programme of public education that people are being influenced to practise birth control voluntarily as part of community life. The special lesson that the Chinese experiment offers is that family planning must not be something dictated by fears, economic pressure, or coercion; but that it must be thought of as being essential to the personal development of both woman and man.

The first family planning drive occurred in 1956 in the cities and affected only about 15 to 20 per cent of the population. In the parks, people queued up for contraceptive distribution; pharmacies exhibited contraceptives openly; films on the birth process and family planning techniques were shown. This was already a break with past prudery and the taboos of tradition.

In rural areas, agricultural co-operatives began in 1956, followed by communes in 1958. For the first time, women worked in the fields, as individuals, not as part of a male-governed family. They were paid wages according to work done, and were voting in the co-operatives on communal projects. Great infra-structural works (road building, dams, reservoirs, canals) to transform the land caused labour shortages in the rural areas and millions of women came out to work—and thereby to acquire status as independent individuals.

At the same time the Woman's Federation also sponsored family planning education in rural areas. The Federation had been instituted in 1950 to achieve countrywide education of women, to promote emancipation and equality, and the new marriage based on individual choices.

But there was a great deal of traditional superstition and ignorance to overcome. In the peasant families I interviewed, husbands were against family planning. One of them, previous to liberation in 1949, had had eight children who had all died of disease and starvation. Now he had remarried and wanted another eight. "We have so much more to eat, why should we not have more children?"

For the first time, as a result of an

HAN SUYIN *is the noted novelist who for 17 years has paid yearly visits to the People's Republic of China. She is the author of a dozen works on China and Asia including "China in the Year 2001" (1967), "Asia today" (1969) and numerous novels. An ardent feminist and medical doctor, she has observed family planning in China (where she was born) since 1956. In this article, originally published in "Unicef News" (No. 78), she sums up her 17-year research and reports the latest facts based on her visit to China in the summer of 1973.*

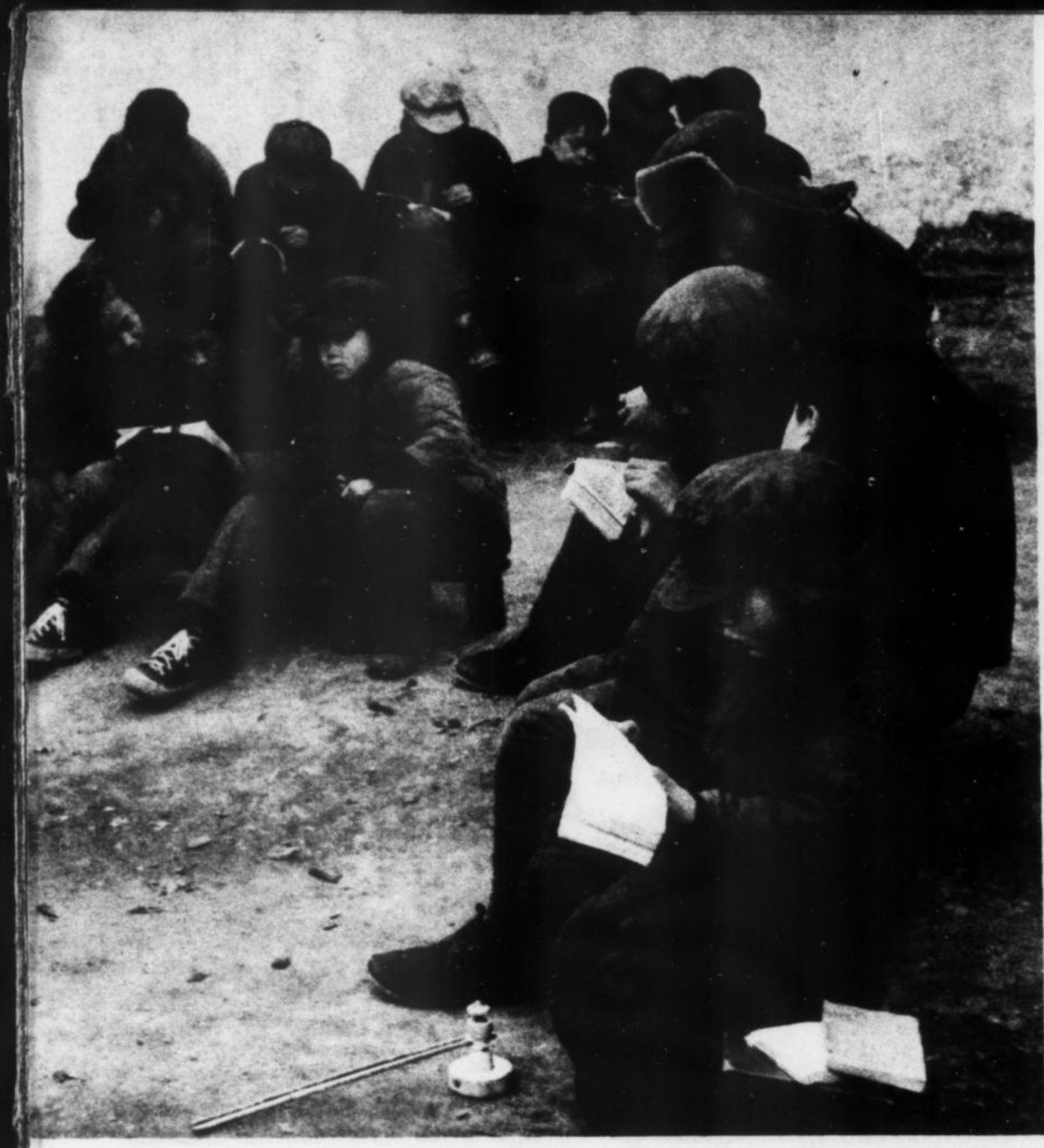


Photo Marc Riboud © Magnum, Paris

A cluster of Chinese children poring over comics in Peking. Most of the stories recount the exploits of revolutionary heroes.

increase in crops, there was no starvation in China's countryside, and the peasants wanted more children as "labour power" to care for them in old age. Also, mothers-in-law, always despotic over their sons' brides, wanted grandchildren quickly and especially grandsons. And finally, ignorance made many people fear contraceptives. "The man becomes impotent"... "the woman's skin becomes yellow..."

On the other hand, the younger women, aware of the crippling effect of numerous and repeated childbirths would ask, "Why should we stay at home and just have baby after baby?" In those days, however, the conservative element was far more prominent. As a result, in the countryside, family planning had an adverse "shock" effect upon the peasantry. They really felt it was wrong even to discuss the matter. The women were too shy to talk about it.

In 1959 and 1960 I was in many industrial cities interviewing women workers in factories, and it was there, for the first time, that I felt the thrill of woman's emancipation. During the Great Leap Forward of 1958, when a stupendous effort was being made to step up industrialization, 80 million women who had never worked before came out to participate in this enormous movement.

I interviewed a woman of 37, with four children, whose husband was a worker. She herself had stayed at home "to look after the family" until in 1958, against her husband's wishes, she mobilized four other housewives, her friends, and all five of them started a small "street factory", making pots and pans for the daily use of people. Within two years, their small factory was producing thermostatic equipment for a large industrial complex in the city.

In the years to follow, I found hundreds of such examples, including *grandmothers* starting "neighbourhood" workshops and street factories. Today, there is not a city in China, not a street, without its small workshops where self-employed housewives are turning out daily goods, including many necessary items and, in some cases, complicated equipment and spare parts for larger factories.

A young woman worker I spoke with in 1966, now a member of the Central Committee, told me that every prospective couple in her factory was instructed in family planning. She and her fiancé had already decided on the number of children they would have. Among industrial workers, in China's expanding industrial sector, family planning is being implanted as a normal accompaniment to marriage.

Everywhere in the cities, the under-thirties mentioned family planning as an essential part of their lives —and of their emancipation. "Of course we want children, but not to be tied down to nappies and the kitchen all the time . . . a woman is as good as a man in work . . . we must also contribute to the transformation of society . . . it is good for our health . . . I saw my mother and father quarrel all the time because of too many babies . . ."

Regulations for mother and child care have also helped to establish the value of a woman's function as mother. A woman is entitled to 56 days of resting time away from work before giving birth, for which she receives full pay. In each factory there are nurseries, and mothers are given breast-feeding time for which they are also paid. I visited textile mills where one can see women leaving their spinning machines and being replaced automatically by spare workers, while they walk to the nursery nearby to feed their baby. During an 8-hour work day, each woman may leave the bench three times to feed her baby for a period of about a half hour. Nurseries are placed next to each workshop so that women are only two or three minutes walk away from their infants.

To relieve working mothers in the cities, there are street nurseries. Every morning and afternoon, one can see quaint little bicycle carriages with 8 or 10 toddlers being taken to the nurseries, by older men, who are called "grandfathers".

However, about 50 per cent of the toddlers are still being cared for at home by grandmothers, for in China the family still largely consists of "three generations living together".

Grandmothers thus become an important social force, which has its good and bad features. On the one hand, it makes for a united family; on the other, the chief dissent to family planning comes from older women,

who often insist, especially in rural areas, on getting their sons married at an early age and on having "grandsons" as soon as possible.

But there are exceptions. In 1966, I saw a grandmother in a commune who had called on the doctor to have her son's wife fitted with a contraceptive, and who went around spreading family planning education.

Today, after the Cultural Revolution, family planning has been solidly organized as a nationwide movement, under a family planning council directed by the Ministry of Health. Branches are established at every level, right down to the smallest village. Both men and women participate in this all-out mass drive. The work is *unpaid* and *voluntary*, with the chief emphasis on direct contact: house-to-house visits, street meetings of housewives, direct talking and persuading.

Over the last two years this direct approach has been used most extensively. In Peking and other cities, each street has its family planners. They hold meetings in which every family is involved and these meetings go on for weeks. Families also have many discussions among themselves. In one street, Kuang An Men, which has about 47,000 people, a collective decision was reached to produce no more than 360 babies in that street during the year 1973.

This "common decision by consensus of all the potential childbearers (about 13 per cent of the women) in the street" was arrived at after each case was debated. Families with more than two or three children were asked to wait, priority for childbearing being given to those couples who wanted a first or second child. "We shall bring our population increase down to 7.5 per thousand, or 0.75 per cent, this year", the street committee woman, a young worker of 30, with one child, said to me.

In 1972, the women employees of childbearing age in one administrative operation decided not to have more than two children each. (Two children is the ideal, but three children are quite common.) "Of course it is sometimes difficult when the two are both girls. Many women still like to have a boy and will try a third time for a boy." This example has now been emulated by many other organizations throughout China. "A girl child is as good as a boy child" is a sentence now heard everywhere.

In another organization (a teaching institute) a priority system for childbearing was agreed on among the staff. A couple without children was due to have one; but a woman with two girl babies was pregnant again; and she insisted that this one was going to be a boy.

"What could be done? She was not only having a third child, but she was actually taking someone else's turn." The matter was solved, however, with another woman voluntarily giving up her turn to have a baby, and having an abortion instead. This public-spirited self-sacrifice may appear strange to other societies, but in China one must remember these decisions are individual, not enforced, and they serve as "examples" to be emulated.

There are countless anecdotes and stories, illustrating the immense debate going on today. There is the young couple with two children who both got a raise in salary, and immediately said, "Now we can have another baby"—an example of the love of children which characterizes the Chinese.

On the other hand there is the example of the two young workers who delayed marriage by another two years (they had already been engaged for two years), to "set an example" in late marriage, perhaps the most effective method of population control.

There is the story of the commune where 175 young couples voluntarily delayed their marriages by one year, and the story of a woman who has nine children, all of them girls, and will continue until she achieves a boy.

There is the commune in Szechuan province, a backward area, where the peasants have carved: "Birth control is a patriotic duty" on a hillside, and the 30-year-old peasant I met in Kueichow province who had seven children and refused to give permission for his wife to be sterilized.

Such contradictory stories are facets of a great human transformation; family planning becomes a moving drama of consciousness, of the emancipation of the woman as a total human being, of the struggle against tradition and ignorance. It is part of the liberation of man too—"Only when woman is liberated will man also be liberated."

In the industrialized areas, in factories, and in the cities, the family planning drive has already achieved a good measure of success. In the Peking area, for instance, 70 per cent of the city workers (clerical staff, workers in factories, etc.) are practising family planning. In Shanghai, an even greater effect is reflected in the

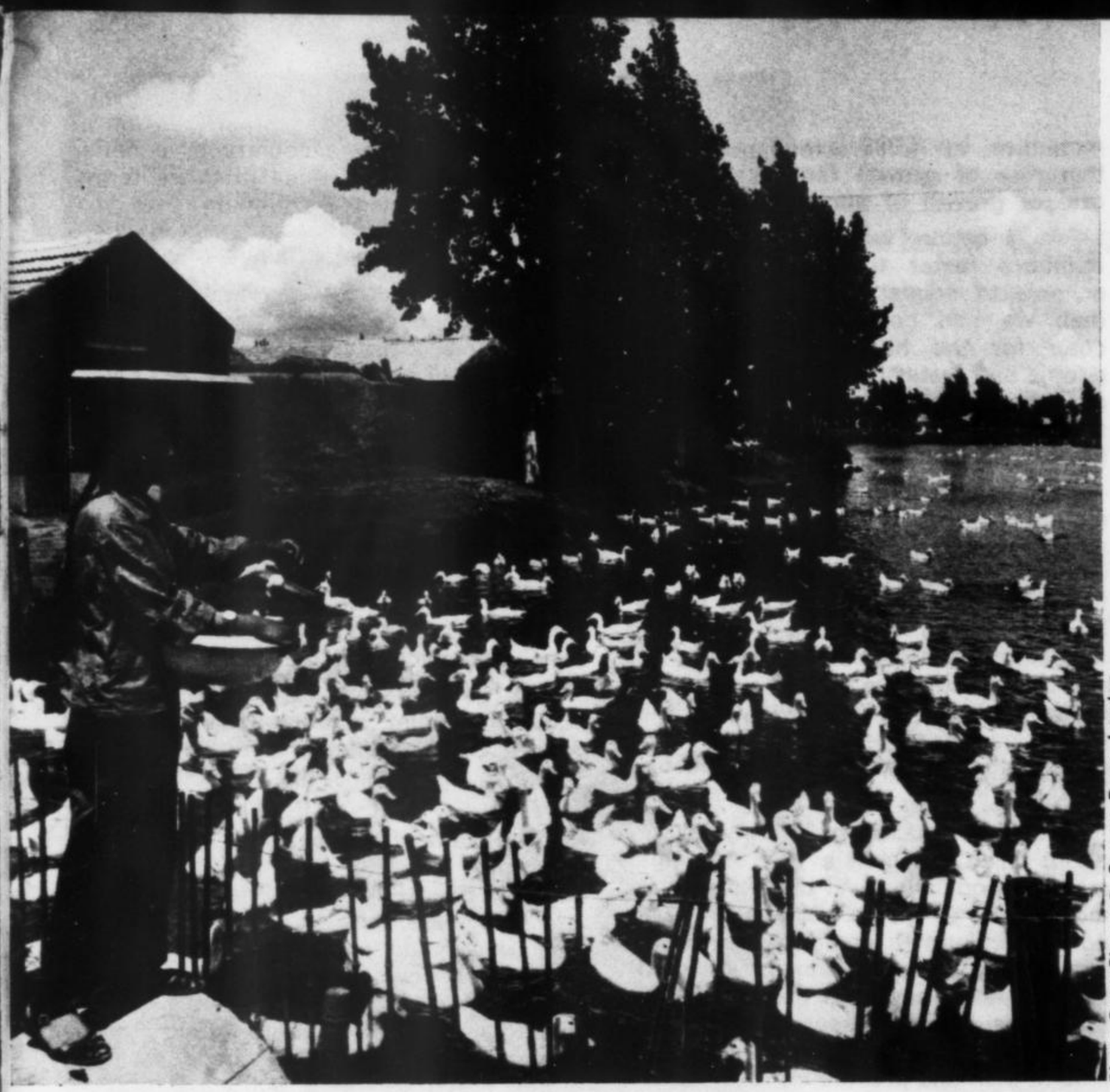


Photo Sven Simon © Camera Press, London

"Why should we stay at home and just have baby after baby?"

population increase rate, which has fallen to 0.6 per cent from a high in 1963 of about 2.5 per cent. In Peking the population increase last year was 1.17 per cent, whereas it was 3.5 per cent in 1963.

But the countryside is also showing progress. Thus, in the county of Hsingtou, in Szechuan (pop. 500,000), 12,000 vasectomies were performed last year.

I visited communes in Chekiang province in 1971, and found each brigade clinic abundantly provided with contraceptives, including the oral pill. But this was not enough. At that time, the "barefoot doctors" were responsible for carrying out family planning—both in spreading propaganda and in providing contraceptives.

They are the young people between 17 and 21 years old who serve 3-5 years in the countryside as paramedical workers, and whose existence —there are 1,300,000 of them—has assured the most complete network of preventive inoculation measures and health care anywhere.

It has now been found out that they are not the ideal medium for this task; people of this age are still considered by the peasantry as "too young to know about such things".

Since 1972, it is through the women cadres, those in the management committees at every level in the rural areas, that the drive for family planning is most effective. These women are middle-aged, married, with children, and practise family planning.

They are "living examples" that family planning works. Painstakingly, they will go from family to family, propagandizing the women, the men. They work with the medical staff, with the barefoot doctors and health workers. They are trusted and accepted by the village women. They bring contraceptives to each house, so there is no excuse of "being too busy" to go to the clinic.

I visited one commune where every morning, the woman secretary stands in the fields and shouts to the working women: "Have you taken your pill?" She checks personally on each and everyone of them. Only in this way can the oral contraceptive become effective. "Most women forget to take it . . . or take it for a little while only . . . But each case is an individual case; we cannot force anything or anyone. So we give them a wide choice."

Since all contraceptives and all operations are free of charge, it is up to the individual to make up his or her mind. Hence, the wide range of contraceptives, and also abortion on demand. "But abortion is not the answer. We want less and less abortions, more prevention."

How can family planning, without coercion, without economic pressures, but only by education and persuasion, be achieved?

It implies, above all, a total refusal to adopt "emergency" attitudes of crisis, to adopt shortcuts and autocratic methods of pressure. Consideration for the human factors, for emotion and tradition, coupled with a continuing process of education for all is what distinguishes the Chinese experiment. ■

Han Suyin

2 x 2 = 1,000
in 10 generations
— Chinese proverb

FAMILY PLANNING

the Ghanaian experiment

by Robert Plant

THE Ghana National Family Planning Programme was launched in May 1970, following growing concern over trends revealed by the 1960 census. Successive governments have supported the project. Its stated purpose is to make information and services available to every Ghanaian couple, so that they may have the number of children they themselves want.

In announcing the programme, the government summarized the case for action in these terms:

"The rapid growth of Ghana's population poses the greatest threat to our economic development and to the welfare of our people. Our population increases by 5,000 every week and this rate of growth far exceeds the rate of growth of our economy.

"As a nation, we are increasing in numbers faster than we can build schools to educate our youth, faster than we can construct hospitals to cater for the health needs of our people and faster than we can develop our economy to provide jobs for the new workers who enter our labour force each year."

Each year in Ghana more than 4,000 mothers die as a result of childbirth and as many as 40,000 of the children who are born do not survive to their first birthday. The government states frankly that the main reason for these appalling figures is the high number of closely spaced pregnancies which are the lot of many Ghanaian women. The government's aim is to ensure that each mother has strong healthy babies who will flourish.

Ghana's population increases at about three per cent a year. At this rate the population will double in little more than 20 years. If the rate of population growth could be cut down to two per cent per annum, it would take 12 years longer for the population to double. "This", says the government, "would give us much needed time to plan and provide for the future."

The promotion of the programme has called for the greatest circumspection. In Ghana, as in most African countries, established cultural practices are pro-natalist in their appeal. Desired family size is still high and the motivation for family planning is generally low. National problems resulting from population pressures appear remote to the present generation of Ghanaians.

In his first annual report, the Executive Director of the National Family Planning Programme, Dr. A. A. Armar, pointed out that : "There is also the fact that, in the face of growing nationalism after long periods of colonialist domination, many view foreign assistance for family planning activities with suspicion. They declare that it has the sinister motive of corrupting the youth, destroying long cherished cultural practices and leading to moral depravity."

These constraints notwithstanding, the programme has made significant strides in its efforts at making family planning an acceptable life style. By the end of June 1972, 140 clinics had been established. Over 2,000 licensed chemical retailers were distributing approved contraceptives of various types. The total number of acceptors was just under 46,000 and the number is steadily growing. New acceptors are now coming in at a rate of 2,500 to 3,000 a month. This is a good start.

The programme makes full use of the many resources, both private and public, that exist in Ghana. Thus the Ministries of Health, Information, and Social Welfare, along with private agencies such as the Planned Parenthood Association and the Christian Council of Ghana, are playing an important role. The Trades Union Congress on its own initiative organized a seminar in 1970 to educate members on the need for family planning.

There are still those who say that the existence of undeveloped land in Ghana invalidates the argument for the regulation of population growth. "They do not realize", says Dr. Armar, "what an enormous investment of capital would be required over a long period before this land could be effectively developed to support a large population. Countries like Ghana simply do not have this capital."

There is still also some concern, sincerely felt in many quarters, that family planning will lead to a breakdown in morality.

On this point, a promotional leaflet, issued by the Ghana National Family Planning Programme, had the following to say:

"The truth of the matter is that lack of family planning, with its attendant evils of overpopulation, overcrowding, unemployment, lack of social services and inadequate food, leads not only to a breakdown of moral behaviour but to many other social ills which eventually lead to a deterioration of society. Family planning is indeed a factor which can help build a strong and healthy nation."

The government does not claim, and never has claimed, that family planning will solve all Ghana's economic problems. Family planning is only one of the measures required to ensure development of the country's economy. Other measures include agricultural development, economic planning, the construction of roads, schools and hospitals.

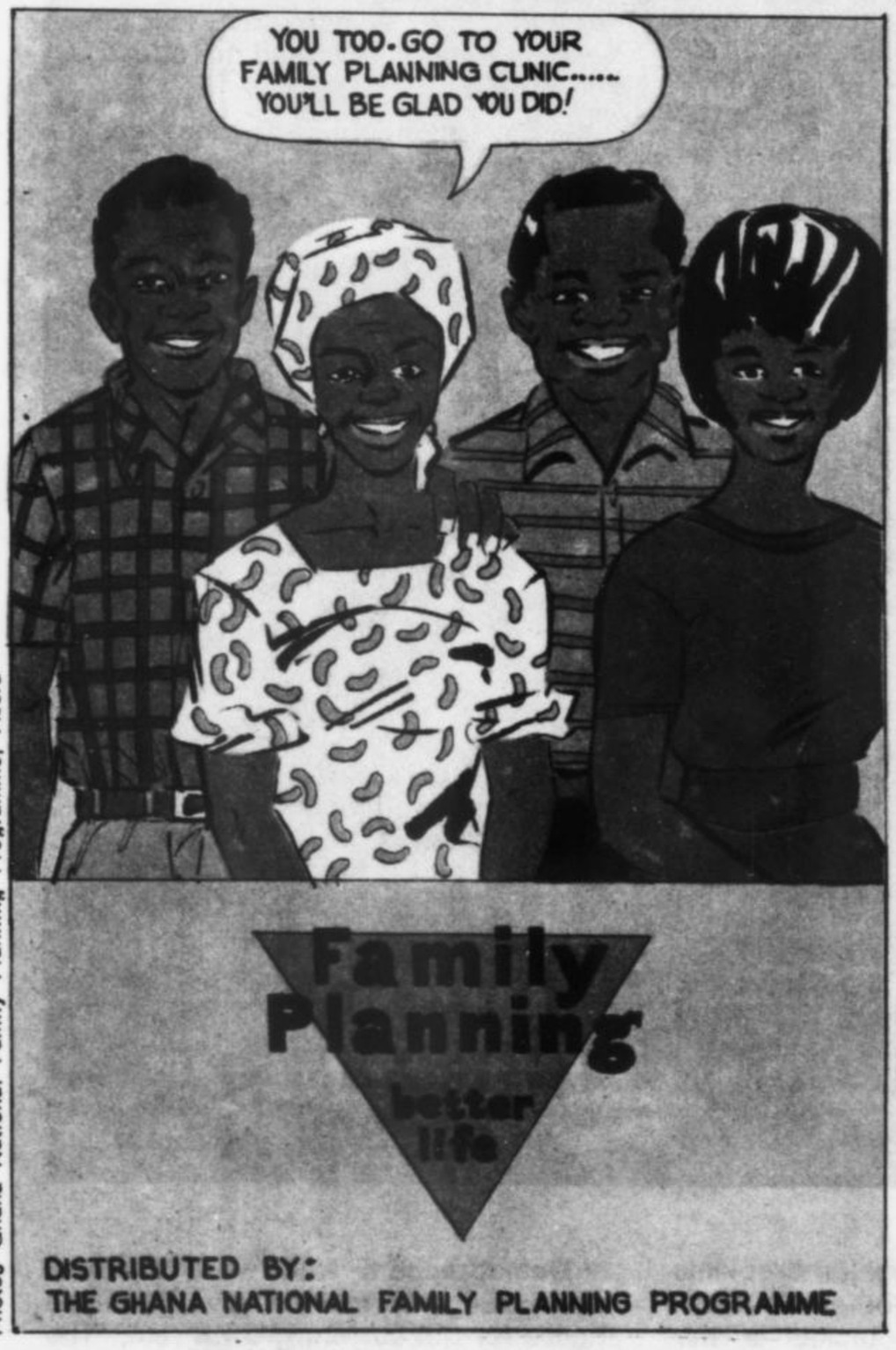
The state of the nation's economy, says Dr. Armar, is reflected in the degree to which prosperity and health are enjoyed by individuals. "If our population continues to increase at the present rate, improvement in our living standards will be retarded. That is why, within the broad framework of the national development effort, the Ghana National Family Programme can be described as one of the most promising programmes the government has undertaken."

The right balance was perhaps struck by Ghana's Head of State, Colonel Ingatius K. Acheampong, when he said in December 1972:

"It is doubtful whether over-population is the major problem facing Africa today. Africa is the least populated of the continents and taken as a whole the temptation to argue for more people may indeed be great. But we live in a world of planning and we have a duty to ensure that we plan as much for the mouths we are going to feed as for the means by which we shall feed them."

The nation should aim, he said, at "the right ratio between the rate of growth of the economy and the rate of population growth." ■

ROBERT PLANT, *Uganda-born editor and journalist, is a specialist in social and economic problems of developing countries. He was senior economics lecturer at the International Labour College, Kampala (Uganda), and is author of "Population and Labour", a study of the consequences of rapid population growth for workers in developing countries (ILO, 1973).*



Photos Ghana National Family Planning Programme, Accra

While certain African countries are opposed to the idea of birth control, others have launched national family planning programmes (see page 47). The Ghana National Family Planning Programme employs every means of popular education to spread the family planning message. The slogan "Family Planning—Better Life" is to be seen everywhere—on pencils, calendars, posters, booklets, newspaper advertisements, car stickers, at the cinema, on the television screen. The emphasis is always on human happiness. The smiling couples above are depicted on the back of a book of strip cartoons entitled "Poverty was my Shadow" which portrays how one couple advised their friends to break out of the vicious circle of poverty by limiting their family. Top, the beginning of a similar story in a play presented by travelling actors. Husband and wife fight over money while the terrified children try to separate them. The overburdened mother already has three children and is expecting a fourth. In this way, the population debate is brought down to the grass roots and the homes of the people.

A mother from Kenya explains:

Why people are frightened of family planning

by Sarah Lukalo

FAMILY planning is nothing new to Africa and definitely not to Kenya. For example, my own family—although there were ten of us—was very evenly spaced out, and in Kenya this was almost universally the case.

We were all about three years apart, and in fact it was considered shameful for women to have children one after the other. There was a number of taboos to discourage this; one of them being that if you had any sexual relationship with your husband when you were breast feeding your baby, you polluted the milk and you believed that your child might die.

Perhaps one of the reasons why modern family planning has become a problem in Kenya concerns methods of approach. Traditionally, there are certain topics that one can discuss with older people and others one can discuss with younger people. But the only people with whom one can discuss almost anything are people of one's own age.

When modern family planning came to Kenya—and I think to almost all African countries—young people were picked to be family planning educators, to go and talk to people much older than they, people who probably commanded a great deal of respect in their own communities. The elders were insulted at having to listen to young people talk about such issues.

Another problem is that there was too much discussion of family planning, as though it were a new thing. The result was that people tended to think that it was indeed a new thing.

I know quite a number of individuals who would refer to family planning field educators as "those girls who kill babies", and there was a belief that birth control methods made one sterile. Many felt that if it were the kind of family planning they already knew, there would have been some connexion between the traditional way of doing things and the new ideas. I think that these are two main reasons underlying the difficulties we face today.

In my view, rather than speaking to people about population growth rates and how much money will be spent to lower them, a human approach would be more effective.

Every woman is touched by what she can see: her own family unit. If, for example, her children are continually falling sick and she goes to the hospital almost every day, she will be likely to accept the idea of family planning if it is suggested, say, as a way of helping her. She will surely realize that in spacing her child-bearing more rationally, she would be better able to look after her children. Perhaps her children face malnutrition, or perhaps she herself is simply overworked and cannot give them adequate care. In any event, she would be bound to see the advantages of family planning.

On the other hand, information about the national population growth rate is so remote that although she may be educated, she will conclude that it is the government's problem and not her own. However, she may feel that although she cannot do much about national population planning, she *can* do something about her own planning and thereby help improve the well-being of her family. ■

the Indonesian experiment

by Haryono Suyono

ONE of the major problems which Indonesia—like other developing countries—has to tackle is the alarming growth of its population.

With 119 million people in 1971, Indonesia is today the fifth most populous nation in the world, exceeded only by China, India, the Soviet Union and the United States of America. The 1930 census listed 61 million in Indonesia, hence within forty years our people have doubled in number. This tremendous increase is neutralizing to a large extent our efforts for planned development and higher living standards.

The huge concentration of people has caused many social and economic disturbances as well as hampering development efforts. In an attempt to remedy this situation, a national family planning programme was integrated in Indonesia's five year development programme in 1970.

Demographers who work in Indonesia are reluctant to give a single figure for the current growth rate. The census in 1971 gave an average annual increase of 2.08 per cent, while the first preliminary count in 1970-1971 gave a growth rate of 2.67 per cent. There is evidence that growth rates in the regions outside Java are higher than in Java.

With the development of basic medical and public health services, especially after Independence in 1945, deaths from epidemics like cholera, malaria and others were controlled or eliminated altogether. All these improvements resulted in a decline in the death-rate, which is now believed to be 17-19 per 1,000. It is highly probable that the mortality decline will continue. As a result, the population of Indonesia is bound to continue its upward leap.

HARYONO SUYONO *is deputy-chairman and co-ordinator of research and development of Indonesia's National Family Planning Co-ordinating Board, in Jakarta.*

In 1973, Unesco organized a literacy study linked with population and family planning in Indonesia, at the request of the Indonesian government. Left, a Unesco literacy team makes a house-to-house survey to check knowledge of family planning in the village of Cikahuripan. Below, in a subsequent functional literacy class a housewife reports after group discussions of the question, and, below left, a farmer works out his family's food budget. Unesco functional literacy teams have carried out similar missions in Tunisia, El Salvador and Philippines at the governments' request.

Photos M. de Clerck - Unesco

Another problem is the age composition of the population. Like other developing countries, Indonesia has a young population with a heavy concentration in the ages 0 to 15. The dependency load in Java and Bali, for example, is 84 per 100 people. This causes heavy burdens for provision of schools and other related needs.

The population aged 10 years and over for Indonesia as a whole was 80.4 million in 1972. 41 per cent had no formal education, 33 per cent had some primary school education and 19 per cent had completed primary school. In Java and Madura, 93 per cent had only some primary education or none at all. The remaining seven per cent had secondary or higher education.

There are marked regional variations in population density. The islands of Java, Madura and Bali make up less than seven per cent of the land area, but they contain two-thirds of the population. Java had a population density of 565 persons per square kilometre in 1971. This makes it one of the most densely populated large areas of the world. The density in the other islands ranged from only 9 in Kalimantan to 37 in Sulawesi.

Many proposals have been elaborated for the movement of large numbers of people from Java to the outer provinces. These efforts began long before the independence of the country in 1945. However, the colonial authorities never managed to move as many as 60,000 people from Java, even during the period of greatest efforts in the 1930s.

After Independence in 1945 the government continued the colonial approach. During the 1950s, a maximum of 40,000 people were moved, a negligible number when related to the size of the problem. In 1969, the year of the largest migration (46,000 people), the population of Java increased by over a million and a half! And while the government was trying to move people from Java to the outer islands, a spontaneous migration in the opposite direction was occurring which might well have resulted in net migration inwards.

In 1953, a small group began to promote family planning. Their early efforts were limited to giving information about the aims and ideas of family planning and inviting the opinions of community organizations and religious leaders. They provided limited services through Maternal and Child Health Clinics. These efforts culminated in the formation of the Indonesian Planned Parenthood Association, in 1957.

In 1967, in his speech to the people on Independence Day, August 16, President Suharto stressed the need to adopt family planning programmes, and in 1969 the government formed a semi-governmental family planning council, the National Institute for Family Planning. It soon became clear, however, that more government involvement was needed, and a National Family Planning Co-ordinating Board was created on January 22, 1970. This Board co-ordinates all family planning activities throughout the country.

The key elements of the programme are communication and provision of family planning services. Both are now taken to the people, involving, where possible, voluntary organizations and local leaders. The idea is to motivate the people to accept the "norm of a small family" and to facilitate its adoption by providing advice and services as near as possible to the home.

If family planning is to be accepted as a way of life by the people, an understanding of the limiting social-psychological factors and other barriers is essential. The relevant factors include:

— universality of marriage,

— early age of marriage,

— obligation of parenthood,

— desire for sons;

and also some social-economic factors such as:

— low level of education,

— low standard of living,

— the belief that each child has his own value.

To counterbalance these, there are also many advantages that the programmes have enjoyed, including the strong support of the government and the absence of organized religious or social opposition.

The information and motivation campaign embraces long-term and short-term stategies. The short-term stategy comprises three programmes:

— public information, by use of mass media such as television, radio, newspapers, magazines, films and others.

— community education, by use of workshops, seminars, group talks and community-oriented family planning campaigns.

— face-to-face programmes by use of specially trained field workers who visit eligible couples in their homes, making them aware of the possibilities of contraception and persuading them to become acceptors.

The aim in the short term is to diffuse the idea of family planning and eliminate barriers. In the long term, population education will be carried out both in and out of school, as is the practice with other programmes aiming at bringing about a change in attitudes and behaviour.

Population education is seen as a process going beyond family limitation in the narrow sense, to make family planning a way of life. Beyond family planning as such is our concern for the totality of the family... health, education, standard of living, quality of life, etc. Family limitation, as we see it, should be an integral part of the larger fabric of family life.

The relationship between the processes of communication and education is fairly clear. In each case, information is provided, persuasion is attempted, and changes in attitudes and behaviour are reinforced. A recent paper published by World Education Reports defines the act of educating as a sequence of activities that incorporate the teaching and learning of separate attitudes, skills, ideas and facts, a linking together of these elements, and obtaining feedback or reinforcement from one's surroundings that may or may not cause the person to incorporate the new attitude or behaviour into his or her personality or behaviour.

Given the structure of the population of Indonesia, and the huge percentage who are not able to go to school, we believe that population education is one of the most important means of implanting family planning ideas. If we combine literacy programmes and population education, we have what might be termed functional population planning—or functional education for family life planning, as it has been called.

What has our national family planning programme achieved so far?

In general the level of awareness of the people toward the idea of family planning has increased tremendously. When we did a study in 1968-69 we found that the level of knowledge about family planning was far below 50 per cent. Today this level has increased to 80 per cent. A recent study in Jogjakarta indicated that 82 per cent of the respondents had heard of family planning and knew that family planning was concerned with the control and spacing of births.

Couples who decide to adopt family planning have the choice of 2,067 family planning clinics throughout Java and Bali. They can also go to private doctors if they wish, and are free to select any method they desire, free of charge. Since 1969, 3 million couples have used these facilities and become new acceptors. 58 per cent are taking pills, 35 per cent use an intra-uterine device (IUD) and the remainder various other methods.

A recent study in West Java indicated that the continuation rate of pill acceptors after two years was 63 to 79 per cent, while the figure for IUD was 78 to 95 per cent. Other studies carried out a year before revealed a similar picture.

Who are the new acceptors? A 10 per cent sample of all new acceptors during the first semester of 1972 indicated that more than 54 per cent were 30 years of age or below, and more than 87 per cent had only elementary school or lower education. The number of illiterate new acceptors was as high as 38 per cent. Peasants constituted 57 per cent of all the new acceptors.

Other significant achievements have been in the field of face-to-face communication, training of medical, paramedical and motivational personnel, research and evaluation, logistics and the infrastructure, and a rapid feedback reporting system. All these generally have developed with the rapid acceleration of the programmes.

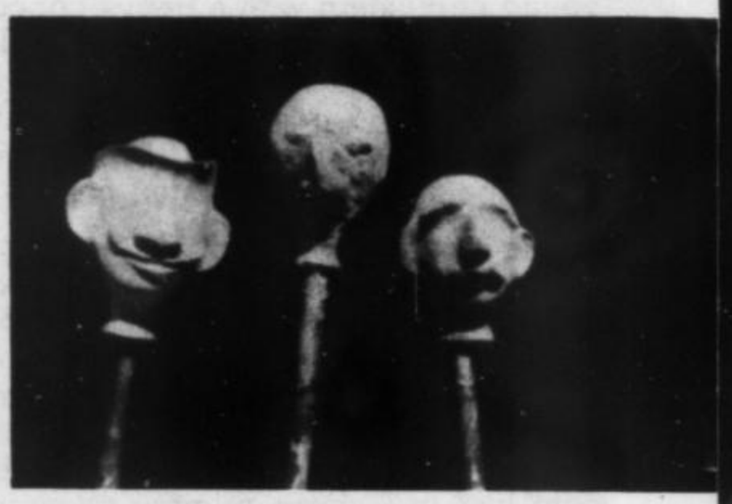
In conclusion, one can say that the family planning programme in Indonesia has been favourably accepted by the people. Though the acceptance rate is not yet as high as we should like in relation to the total population, the acceptors are highly motivated.

We are confident that population education and functional literacy programmes as part of an integrated approach to family planning will eventually spread the acceptance of the family planning concept throughout Indonesia. ■

Haryono Suyono

PUPPETS PROMOTE FAMILY PLANNING

Photos Unesco



For some years now India has organized nation-wide family planning campaigns in an effort to reduce its birth-rate. These campaigns take various forms. The most effective make use of traditional media of expression and communication, such as dancing, singing, poetry, folk tales and puppets, since it has been found that the people accept a new idea like family planning more readily from familiar folk arts than from the modern mass media. These photos show scenes from a puppet play performed in an Indian village with the simple message: family planning will help to solve your problems. They are from a film entitled "Folk Media", made in India by Unesco as one of a series on the general theme, "Family Planning Communication". Two other films in the series have so far appeared. They portray similar experiments which have been carried out in Kenya and Iran, and are available in French, English and Spanish.

Population policy in Latin America

A vast continent where different conditions have produced different answers

LIKE other regions of the world, and perhaps even more than others, Latin America is a mosaic of widely varying attitudes, criteria and standards vis-à-vis the world-wide phenomenon which is known as the "population explosion".

Countries in this region have adopted very different and even completely opposed positions in their approach to this immense problem. There are countries, such as Argentina, which are categorically in favour of a policy of openly encouraging high population growth, while others, such as El Salvador and the Dominican Republic, are pursuing a no less categorical policy of birth control.

Whatever their positions, however, there is unanimous agreement among Latin American governments that the formulation of population policy is the sovereign right of each country.

These were the main conclusions which emerged from the discussions of the Latin American meeting preparatory to the forthcoming World Population Conference. This was held in San José, Costa Rica, last April. During the meeting it became clear that the governments of the region shared a deep preoccupation with the phenomenon of population growth, matched by an equally deep appreciation of the diverse political, social and economic circumstances obtaining in this part of the world. These circumstances inevitably determine the approach to population questions adopted by each country.

A study prepared by the United Nations Economic Commission for Latin America (CEPAL), which was used as a basis for debate at the Costa Rica meeting, divides Latin American countries into five categories according to their attitudes on matters of population policy. These are as follows:

1 Countries whose governments have declared themselves in favour of accelerated population growth. This is the case of Argentina and Uruguay.

According to the Argentinian representative at the Costa Rica meeting, "Latin America should defend population growth as a positive factor in development." Argentina's new population policy has two main objectives: to increase the population at a more rapid rate and to ensure a more balanced distribution of the population throughout the country.

This means that "the country's demographic patterns must be changed in order to ensure a high growth rate and thereby occupy our territory more efficiently, develop our resources to the full and be able to rely upon an adequate domestic market", etc.

2 Countries whose governments consider that the present population statistics and their estimated future trends are satisfactory and that in consequence the State should avoid setting population standards and objectives. This is the position of Brazil and Peru.

The government of the latter country considers that understanding of the world population problem would gain in amplitude and depth if there were to be an objective analysis of existing relationships between demographic, social, economic and political factors. The Peruvian delegate to the Costa Rica meeting stressed the vital importance of "pointing out and rejecting the fallacy of those who consider that the problems of Peru (in other words, the problems characteristic of a developing country) are caused by high population growth and that the solution to these problems lies in curbing it."

The fact is, he declared, there is no harm in a demographic growth rate of 2.9 per cent "in a country with plenty of space and an adequate quantity and variety of natural resources, as is the case in Peru. The Revolutionary Government and the Peruvian people must therefore concentrate their attention and all their efforts on finding a radical solution to all those problems of a structural order which constitute

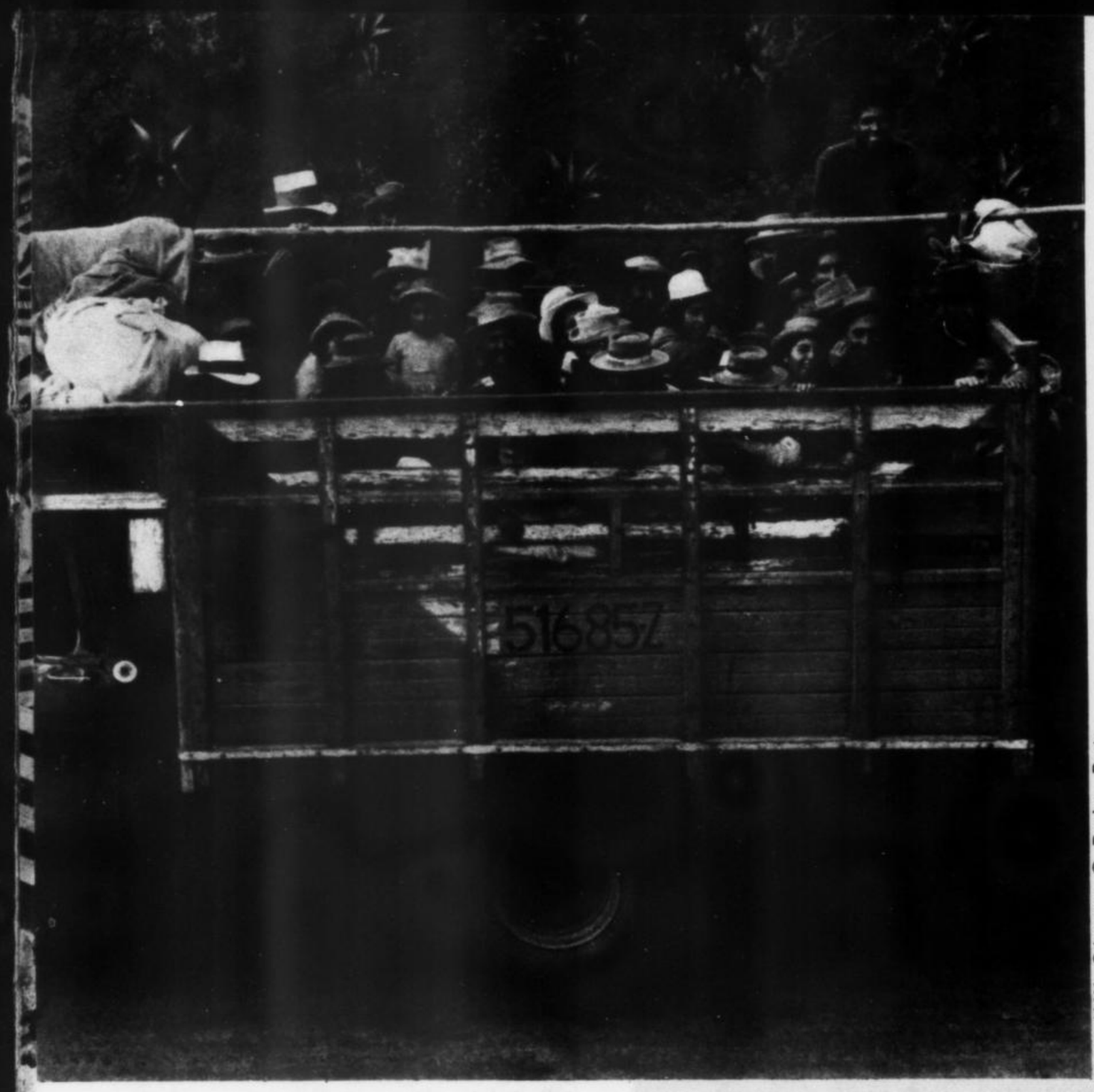


Photo H.W. Silvester © Rapho, Paris

the real source of difficulty for the people of Peru."

The Brazilian Delegate, Miguel A. Ozorio de Almeyda, emphasized the fact that in a number of Latin American countries a considerable population increase is essential for acceleration of their economic development.

3 The third group consists of countries whose governments have stated their intention of taking action through nation-wide programmes designed to have long-term effects on their birth-rates, but which have refrained from setting definite population objectives. This group includes Colombia, Mexico, Cuba, Costa Rica, Chile, Guatemala, Nicaragua, Panama and perhaps to some extent Ecuador.

Mexico is applying a qualitative rather than a quantitative population policy, whose essential aim is "to raise the standard of living of all Mexicans" and to make every effort "to provide greater opportunities for all with a view to bringing about continued change, and not as a limitation to protect privileges."

Cuba considers that under-development problems are not caused by population growth at all, and its efforts have therefore been directed not at controlling demographic processes, but at bringing about structural change aimed at stimulating development. The Cuban representative at the meeting expressed the view that a rigid population policy can only be defined in the context of overall development policy, which it should reinforce and complement; the history of world population growth shows that the adoption of population control is a corollary to development, not a prerequisite.

Within the same group, Guatemala also maintains that birth control is not the universal panacea, the unique formula for the solution of problems of population and their consequences. There is no national family planning policy in Guatemala, but there exist family guidance programmes adapted to the attitudes and motivations specific to the Guatemalan people.

4 The fourth group identified by CEPAL comprises those countries whose governments support special family planning programmes at local level or on a limited scale.

5 The fifth and final group consists of countries which have formulated and applied overall policies designed to reduce population: El Salvador, the Dominican Republic and Honduras.

El Salvador, a country with high population density and intense demographic growth, advocates the formulation of an integrated population policy which its delegate defined as "a series of actions planned and coordinated by the public authorities", aimed at bringing about the greatest possible individual, family and social well-being by means of the "rationalization of population dynamics."

Finally, in the Dominican Republic, another of the decidedly antinatalist Latin American countries, the government gives its unqualified support to every type of action aimed at curbing the birth-rate, and actively promotes family planning programmes to enable couples to avoid unwanted pregnancies and to have children who are wanted at the time they believe to be right.

It must be pointed out that these widely divergent attitudes to population policy are determined by numerous and extremely varied factors, some of which are common to the world at large and others which are confined to Latin America.

Without attempting to make an analysis, which would of necessity be a big and complicated task, one can list some of these factors. They are: population growth index (with radical differences such as that between Argentina's 1.2 and Costa Rica's 3.8); density of population (El Salvador has a "European" population density, while Argentina, Brazil and Bolivia have vast areas of virtually uninhabited territory); the ethnic composition of the population (countries with a very large Indian or mixed-blood population such as Mexico, Peru, etc., or with a population of essentially European origin, such as those of the "Cono Sur"); wealth or scarcity of natural resources; psychological and cultural factors, the type of general policy applied in each country.

With so many variables, it is not surprising that Latin America does not speak with one voice in the great population debate. ■

Text © Copyright.
Reproduction prohibited

LET'S SUPPOSE...

A tale for the year 3550 A.D.

by Isaac Asimov

ISAAC ASIMOV, *noted American scientist and science fiction writer, is the author of over 60 books ranging from a textbook on biochemistry (he is associate professor of biochemistry at Boston University School of Medicine) to a small book on man-made satellites for eight year olds. According to the latest edition of Unesco's "Index Translationum" he is the world's most translated author of science fiction (37 translations in 1971). This article is taken from his forthcoming book for children "Earth: Our Crowded Spaceship" to be published next month under the auspices of UNICEF by John Day Co., New York. The text is copyright © 1974 by Isaac Asimov, and is reproduced by kind permission of the publisher.*

SUPPOSE the whole world became industrialized and that industry and science worked very carefully and very well. How many people could such a world support? Different limits have been suggested, but the highest figure I have seen is 20 billion. How long will it be before the world contains so many people?

For the sake of argument, and to keep things simple, let's suppose the demographic growth rate will stay as it is now at two per cent per annum. At this rate, it will take 35 years for the population to double, so it will take the present world population of 3.8 billion 70 years to reach the 15.2 billion mark. Then, fifteen more years will bring the world population to our 20 billion. In other words, at the present growth rate our planet will contain all the people that an industrialized world may be able to support by about 2060 A.D. That is not a pleasant outlook for only 85 years from now.

Suppose we decide to hope for the best. Let us suppose that a change *will* take place in the next 70 years and that there will be a new age in which population can continue rising to a far higher level than we think it can now. This means that there will be a new and higher limit, but before that is reached, still another change will take place, and so on. Let's suppose that this sort of thing can just keep on going forever.

Is there any way of setting a limit past which nothing can raise the human population no matter how many changes take place?

Suppose we try to invent a real limit; something so huge that no one can imagine a population rising past it. Suppose we imagine that there are so many men and women and children in the world, that altogether they weigh as much as the whole planet does. Surely you can't expect there can be more people than that.

Let us suppose that the average human being weighs 60 kilogrammes. If that's the case then 100,000,000,000,000,000,000,000 people would weigh as much as the whole Earth does. That number of people is 30,000,000,000,000 times as many people as there are living now.

It may seem to you that the population can go up a long, long time before it reaches the point where there are 30,000,000,000,000 times as many people in the world as there are today. Let's think about that, though. Let us suppose that the population growth-rate stays at 2.0 per cent so that the number of people in the world continues to double every 35 years. How long, then, will it take for the world's population to weigh as much as the entire planet?

The answer is—not quite 1,600 years. This means that by 3550 A.D., the human population would weigh as much as the entire Earth. Nor is 1,600 years a long time. It is consider-

ably less time than has passed since the days of Julius Caesar.

Do you suppose that perhaps in the course of the next 1,600 years, it will be possible to colonize the Moon and Mars, and the other planets of the Solar system? Do you think that we might get many millions of people into the other world in the next 1,600 years and thus lower the population of the Earth itself?

Even if that were possible, it wouldn't give us much time. If the growth-rate stays at 2.0 per cent, then in a little over 2,200 years—say, by 4220 A.D.—the human population would weigh as much as the entire Solar system, including the Sun.

We couldn't escape to the stars, either. Even if we could reach them; even if we could reach *all* of them; population would reach a limit. If the growth-rate stays at 2.0 per cent, then in 4,700 years—by about 6700 A.D.—the human population would weigh as much as the entire Universe.

So you see we can't go on forever at the rate we are going. The population rise is going to have to stop somewhere. We just can't keep that 2.0 per cent growth-rate for thousands of years. We just can't, no matter what we do.

LET'S try again, and let's be more reasonable. Suppose we go back to considering the density of population on Earth.

Right now, the average density of population on Earth is 25 per km². If the population of the world doubles then the average density of population also doubles, since the area of the world's surface stays the same. This means that at a population growth-rate of 2.0 per cent per year, the average density of population in the world will double every 35 years.

In that case, if the growth-rate stays where it is, how long will it take for the average density of population to become 18,600/km²? Such a density is almost 750 times as high as the present density, but it will be reached, at the present growth-rate, in just about 340 years.

Of course, this density is reached only if human beings are confined to the land surface of the world. Perhaps human beings will learn to live on the bottom of the ocean, or on great platforms floating on the sea. There is more than twice as much ocean surface as there is land surface and that would give more room for people.

That wouldn't do much good, however. At the present growth rate, it would take only 45 additional years to fill the ocean surface, too. In 385 years, the average density of population would be 18,600/km² over land and sea both. That would be by about 2320 A.D.

But a density of 18,600/km² is the average density of population of the island of Manhattan.

Imagine a world in which the average density everywhere, over land and sea alike—*everywhere*—in Antarctica and Greenland, over the oceans and along the mountains, over the entire face of the globe—was equal to that of Manhattan. There would have to be skyscrapers everywhere. There would be hardly any open space There would be no room for wilderness or for any plants and animals except those needed by human beings.

Very few people would imagine a world like that could be comfortable, yet at the present growth-rate we will reach such a world in only 385 years.

But let's not pick Manhattan. Let's try the Netherlands. It is a pleasant, comfortable nation, with open land and gardens and farms. It has a standard of living that is very high and yet its average population density is 400/km². How long would it take for our population to increase to the point where the average density of the surface of the world, sea and land, would be 400/km² ?

The answer is 200 years, by about 2175 A.D.

You see, then, that if we don't want to go past the average population density of the Netherlands, we can't keep our present growth-rate going even for hundreds of years, let alone thousands.

In fact, we might still be arguing in an unreasonable way. Can we really expect to have a world-wide Netherlands in the next 200 years ?

No one really believes that mankind can spread out over the ocean bottom or the ocean top in the next 200 years. It is much more likely that man will stay on land. To be sure, there may be some people who would be living off shore in special structures, on the sea or under it. They would make up only a small fraction of all mankind. Almost everybody will be living on land.

Then, too, not every place on land is desirable. It isn't at all likely that there will be very many people living in Antarctica or in Greenland or in the Sahara Desert or along the Himalaya Mountain range over the next 200 years. There may be some people living there, more people than are living there now, but they will represent only a small fraction of the total population of the Earth.

In fact, most of the Earth's land surface isn't very suitable for large populations. At the present moment, most of the Earth's population is squeezed into that small portion of Earth's land surface that is not too mountainous, too dry, too hot, too cold, or too uncomfortable, generally. In fact, two-thirds of the world's population is to be found on a little over 1/13 of the land surface of the planet. About 2,500,000,000 people are living on 11,000,000 sq. km. of land that can best support a high population.

The average density on the 11,000,000 square kilometres of the best land is 230/km², while the average density on the rest of the land surface is just under 10/km².

Suppose the population continues to increase at the present growth-rate and the distribution remains the same. In that case, after 30 years, the average population density of the less pleasant parts of the Earth will reach the 19/km² figure, but the density of the 11,000,000 square kilometres of best land will be 400/km².

In other words, we will reach a kind of world-wide Netherlands density-figure, for as far as we can go, in only about 30 years.

But will all the world be as well-organized and as prosperous as the Netherlands is now? Some of the reasons why the Netherlands is as well off as it is now, are that it has a stable government, a highly-educated population, and a well-organized industrial system.

This is not true of all nations and they need not expect to be as well off as the Netherlands when they are as crowded as the Netherlands. Indeed, if they have an agricultural way of life and a poorly-educated people, who don't have long traditions of stable government, then a population as dense as that of the Netherlands now is, would only bring misery.

IN other words, the world can't keep going at the present growth-rate, even for tens of years, let alone for hundreds or thousands.

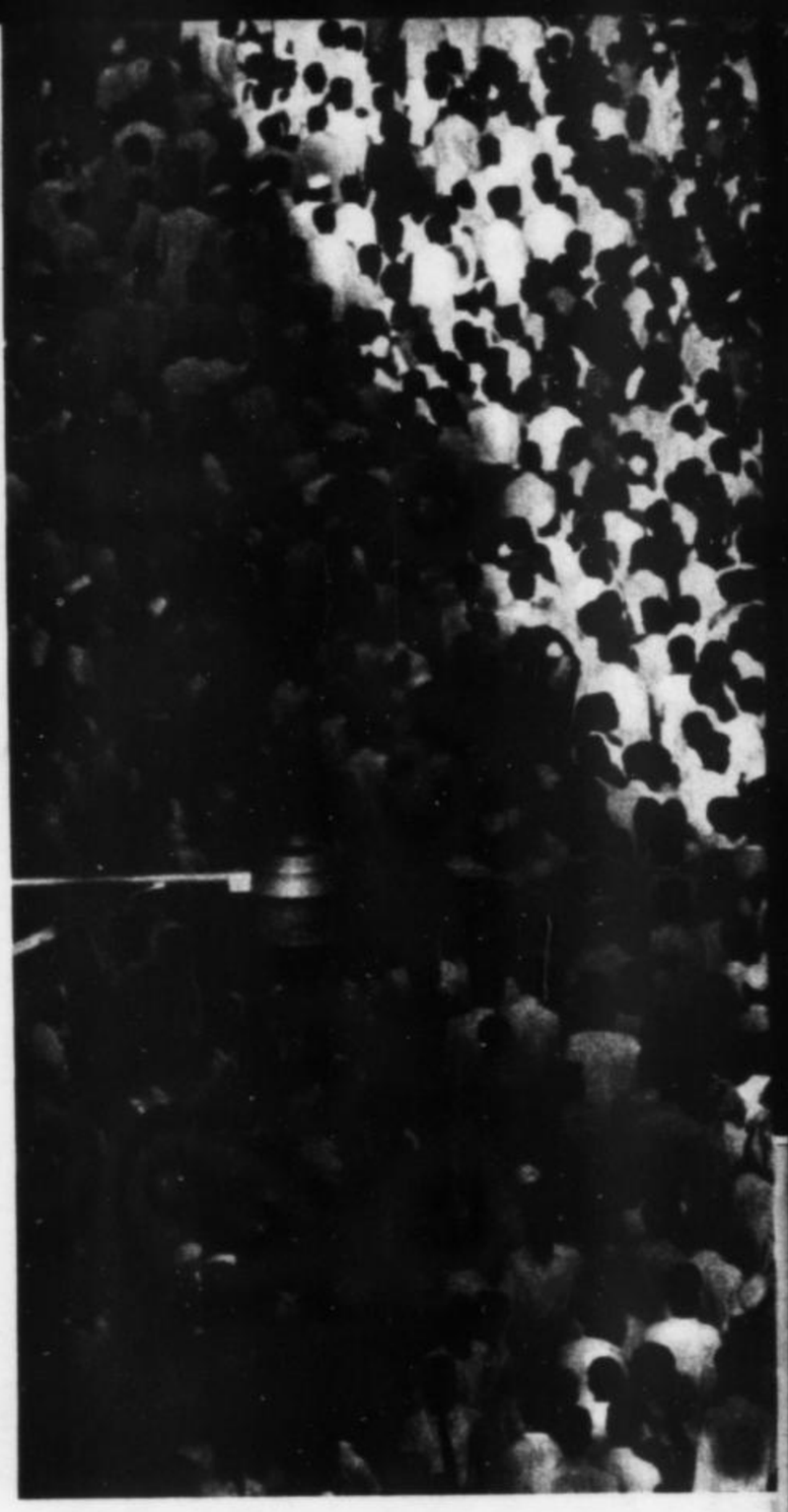
The matter of a population limit is not a problem for the future, then. We might just as well realize that the world is just about reaching its population limit *now*.

Of course, this entire argument is based on the supposition that the population growth-rate will stay the same as it is now. If the growth-rate drops, that obviously will give us more time before the limit is reached. If it drops to zero, the limit will never be reached. Even a 1 per cent per year population increase, however, is enough to bring disaster. So we can't just sit back and do nothing. We will have to do something. ■

Isaac Asimov

From Confucius to Malthus...

Since antiquity men have asked: 'Is there an optimum population?'



MAN has been concerned with population problems since ancient times. From antiquity, statesmen and thinkers have held opinions, based on political, military, social and economic considerations, about such issues as the most desirable number of people or the need to stimulate or retard population growth.

Ideas and theories on population have nearly always revolved round the real or supposed problems of individual societies and have stimulated the most response when directed specifically towards those problems. Thus the ideas of the philosophers of ancient Greece dealt mainly with the population questions faced by the city-state with a relatively small population. In the Roman Empire the views on population reflected the populationist outlook of a society in which population was considered a source of power.

The thesis that excessive population growth may reduce output per worker, depress levels of living for the masses and engender strife is of great antiquity. It appears in the works of Confucius and his school, as well as in the works of other ancient Chinese philosophers.

Some of these writings suggest that the authors had some concept of optimum population, as far as the population engaged in agriculture was concerned. Postulating an ideal proportion between land and population, they held the government primarily responsible for maintaining such a proportion by moving people from over-populated to under-populated areas, although noting also that government action was reinforced at times by spontaneous migration.

These ancient Chinese writers also paid some attention to another aspect which has occupied an important place in subsequent literature on population theory, that is, the checks to population growth. They observed that mortality increases when food supply is insufficient, that premature marriage makes for high infant mortality rates, that war checks population growth and that costly marriage ceremonies reduce the marriage rates, although they paid little attention to the manner in which numbers adjusted to resources. Despite these views on population and resources, the doctrines of Confucius regarding family, marriage and procreation were essentially favourable to population increase.

The writers of early Greece were more concerned with the formulation of policies and rules for population than with theories about it. Plato and Aristotle discussed the question of the "optimum" population with respect to the Greek city-state in their writings on the ideal conditions for the full development of man's potential.

They considered the problem of population size not so much in economic terms, but more from the point of view of defence, security and government. The thought was that population should be self-sufficient, and thus possess enough territory to supply its needs but not be so large as to render constitutional government impossible.

The more specific observations on these conditions were made by Plato, particularly in his *Laws*. He held that if the so-called "highest good" was to be achieved, the city-state should have 5,040 citizens. Since the actual course of demographic trends might result in either an excess or a shortage of population, Plato also proposed measures to be taken in order to maintain the desired size. In the case of under-population, he recommended rewards, advice or rebuke to the young in order to increase the birth-rate, and, in the last resort, immigration. To remedy over-population he proposed birth control for large families and, if necessary, colonization.

Aristotle dealt with population problems particularly in his *Politica*. He was less specific than Plato on the matter of optimum population but stated that in size and extent the State should be such as to enable the inhabitants to live at once temperately and liberally in the enjoyment of leisure.

He held that land and property could not be increased as rapidly as the population would grow and concluded that an excessive number of inhabitants would breed poverty and social ills. Among the factors which could prevent an excessive population he mentioned child exposure and abortion.

The Romans viewed population questions in the perspective of a great empire rather than a small city-state. They were less conscious than the Greeks of possible limits to population growth and more alert to its advantages for military and related purposes. Perhaps because of this difference in outlook, Roman writers paid less attention to population than the Greeks. Cicero rejected Plato's communism in wives and children and held that the State's population must be kept up by monogamous marriage.

The preoccupation with population growth, the disapproval of celibacy and the view of marriage as primarily and fundamentally for procreation was mainly reflected in the Roman legislation of that time. Particularly the laws of Augustus, creating privileges for those married and having children and discriminating financially against those not married, aimed at raising the marriage and birth-rates.

The Hebrew sacred books placed

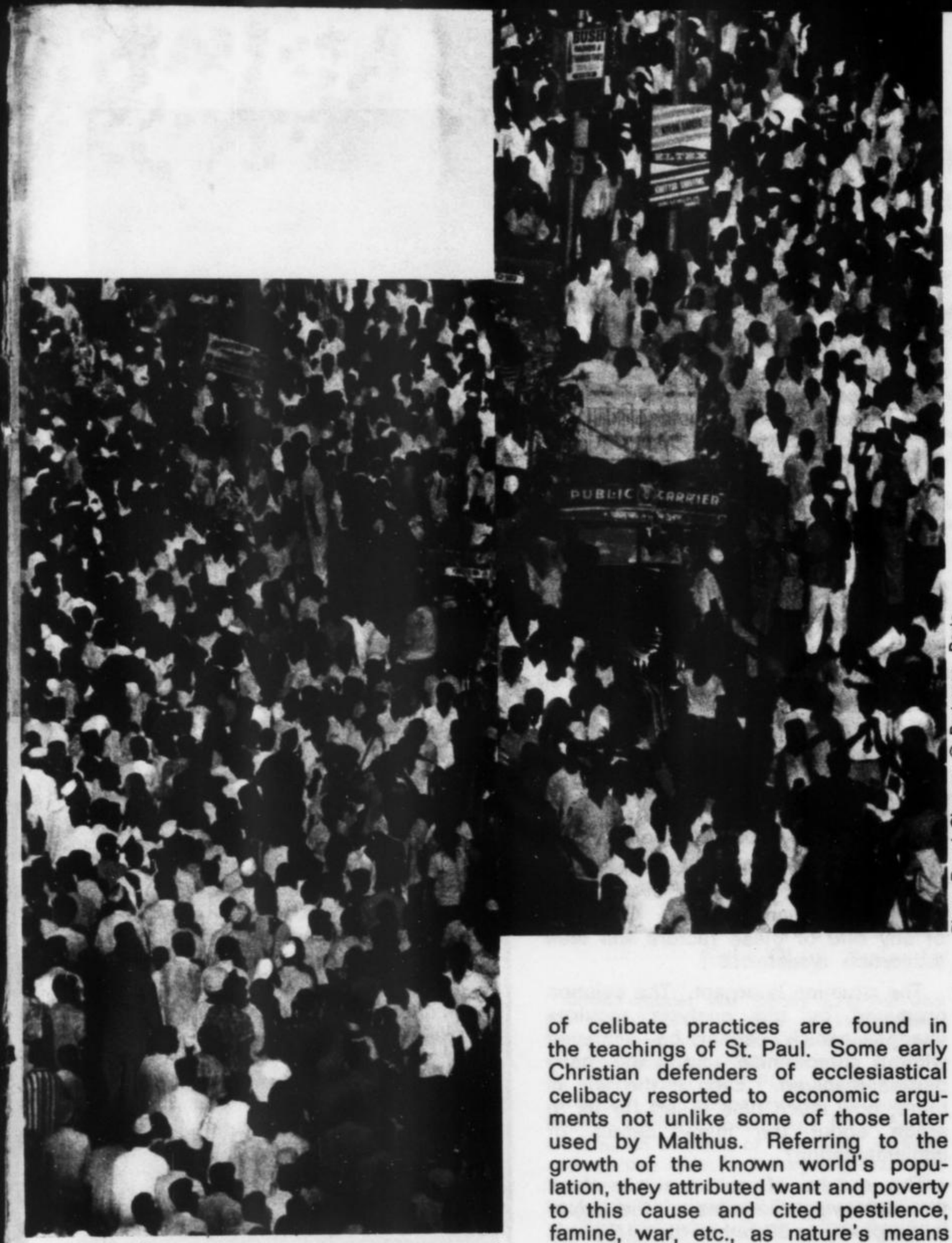


Photo David Channer © Parimage, Paris

much emphasis on procreation and multiplication and, for this reason, unfruitfulness was regarded as a serious misfortune. In general, Oriental philosophers appear to have favoured fertility and multiplication. An exponent of some of the views on population for the period dating back to some three to four centuries B.C. is *Arthasàstra*, a book written as a guide for rulers and attributed to Kautalya. The work discusses such aspects as the desirability of a large population as a source of military and economic power (although recognizing that the population may become too large); the effects of war, famine and pestilence, and the colonization and settlement of new areas.

Early and medieval Christian writers considered questions of population almost entirely from a moral and ethical standpoint. Their doctrines were mainly populationist but less so than those of Hebrew writers. On the one hand, they condemned polygamy, divorce, abortion, infanticide and child exposure; on the other, they glorified virginity and continence and frowned upon second marriage.

The main arguments in favour of celibate practices are found in the teachings of St. Paul. Some early Christian defenders of ecclesiastical celibacy resorted to economic arguments not unlike some of those later used by Malthus. Referring to the growth of the known world's population, they attributed want and poverty to this cause and cited pestilence, famine, war, etc., as nature's means of reducing excess population.

The prevailing tendency, however, was to favour, as in earlier times, population growth. The high mortality which was found everywhere and the constant threat of sudden depopulation through famine, epidemics and wars predisposed most writers towards the maintenance of a high birth-rate. The opposition to birth control, for instance, was based not only on church doctrine but also on a fear of depopulation.

The views of Muslim authors on population resemble those of the Hebrew and Christian authors. Special mention should be made, however, of the interesting but long unrecognized work by Ibn Khaldoun, an Arab author of the fourteenth century. His opinions are noteworthy in two respects.

In the first place, he held that a densely settled population was conducive to higher levels of living since it permitted a greater division of labour, a better use of resources and military and political security.

Secondly, he maintained that a State's periods of prosperity alternate with periods of decline and that cyclical variations in the population occur in rhythm with these economic fluctuations. Favourable economic conditions and political order stimulate population growth by increasing natality and checking mortality. In the wake of these periods of economic progress come luxury, rising taxes and other changes which in several generations produce political decline, economic depression and depopulation.

At the dawn of the modern era, the emergence of the nation-states and the related issue of power led mercantilist writers to emphasize once again the advantages, both political and economic, of a large population. Malthus's contrary theory had its roots in political, economic and social issues which existed during his time. The same can be said of Marxist views on population.

More recent developments in population theories have been influenced predominantly by two factors. The first of these was the upsurge of population growth, especially in the developing countries. This fact has created a need for a better understanding of the factors in population growth. Secondly, the nearly universal preoccupation with the problems of development has called for a considerably more penetrating theoretical framework for assessing the interrelations between population and economic and social development.

The search for an acceptable population theory has thus gained importance. If such a theory could be elaborated, it would provide a better insight into the development process, and could constitute a basic element in policy-making and planning for development. ■

This text is abridged from the chapter on population theory in "The Determinants and Consequences of Population Trends", a 2-volume study published by the U.N. Department of Economic and Social Affairs (New York, December 1973, $24).

A COMPUTER WARNING OF HUNGER TOMORROW

(Continued from page 34)

circumstances no population policy could function any more.

Starvation would not be limited to isolated small areas from which people could escape, but would extend its stranglehold over vast regions inhabited by hundreds of millions. The population would be trapped and there would be no fertile areas to go to as the recent events in semi-arid Africa have so tragically shown. There is no historical precedent for this kind of slow, inexorable destruction of the population of entire regions which at their peak were inhabited by several billion people.

No doubt these events would eventually lead to an equilibrium population, and one might see this as a return to the days before the population explosion took place, i.e. to the times when birth-rate and death-rate were nearly in balance. But, surely, this must not be allowed to happen. Obviously a solution requires a more effective population policy.

Third scenario

In the *third scenario* we have assumed that the equilibrium fertility rates are achieved in 25 to 30 years rather than in 50 years as in the first scenario. Possibly an optimistic assumption, but certainly one that should be achievable.

Even under these more favourable conditions the analysis shows that severe malnutrition cannot be avoided unless food imports are made available, but the required imports are, this time, on a much smaller scale and the really large needs appear at a later date than in previous scenarios, starting in the 1990s rather than the 1980s.

Also, the amount of food which would have to be covered by imports would be reduced to about one fifth of the needs. The volume of the imports, in reference to production, transportation, etc., might then be manageable, but the economic impact of food import would still be devastating. The problem, however, would be reduced to economics.

Fourth scenario

In order to see how this cost-economic obstacle to the solution might be removed, we designed the *fourth scenario* in which we assumed that investment aid is provided to South Asia in sufficient amounts and at the required time to close the food gap. The magnitude of such a programme would require a concerted action by all regions of the "North".

The analysis indicated a substantial increase in the export potential of South Asia. If the world economic situation realizes this great potential, South Asia could pay for the bulk of the necessary food import. The export must be industrial, since the agricultural sector will be occupied with the demands of the region.

This means that South Asia must be allowed to develop its own exportable and competitive industrial specialization which will not be left to the mercy of narrow national interests but rather will rely on long-term world economic arrangements. This, in turn, will require the emergence of a new global economic order in which industrial specialization corresponds to regional capacities, the most effective utilization of labour and capital and of available world resources, on a long-term basis.

To summarize, the only feasible strategy to meet the world food situation calls for:

- a global approach to the problem;
- productive investment and not only commodity aid;
- balanced economic development for all regions;
- a world-wide diversification of industry leading to a truly global and balanced economic system;
- an effective population policy.

This strategy is also the conclusion reached by our model for every other sector of human activity. Omission of any one of these factors will lead to certain disaster.

The situation is urgent. The solution produced by our analysis requires changes which cannot be achieved without compromise among the many parties involved. Even if the will is there, how much time is left for us to argue about the many details of implementation?

The results of our analysis show that achieving the aims of the population policy in 30 rather than 15 years would make a difference of 80 per cent to the number of births. A mere 20 years delay in initiating such a policy would lead to a 300 per cent increase. The inescapable conclusion is that time is indeed short. Delay in implementing the options to bring food supply and need in balance could be fatal. ■

Mihajlo Mesarovic
Eduard Pestel
and Maurice Guernier

'All our estimates are inflated...'

... In our forecasts for 1940-60 we were caught off our guard. We underestimated, not the magnitude of population growth but its acceleration. Some of the experts have now been caught out by the opposite phenomenon, the deceleration of population growth. In point of fact, the decline in birth-rates which we are about to see on a world scale has already set in much more steeply in some cases than was foreseen even on the so-called low fertility assumption. Such cases will be a majority in the future...

All our present estimates are inflated... They were obtained by extrapolation from previous situations which are now changing and in some cases reversing... The rate of deceleration is even more alarming than the previous acceleration... Since 1955 the brakes have been applied sharply in Eastern Europe, since 1957 in the United States and since 1962 in Western Europe. In fact, we are entering a phase of neither acceleration nor deceleration but of demographic stop-go which, one way or another, may well cost us dear...

Nothing could be unhealthier than the obsessive fear of life which has been fanned abroad. Surely, it would be better not to apply the brakes, if we have to step on the accelerator again soon afterwards. Spasmodic population growth is the enemy of harmonious social development and an effective education policy.

Pierre Chaunu

professor of modern history at the University of Paris-Sorbonne

From "Histoire et Prospective" (History and Prospective), published in "Revue Historique", Paris, (July-September 1973)

BOOKSHELF

■ **Population, Resources, Environment, Issues in Human Ecology**, by Paul R. Ehrlich and Anne H. Ehrlich. Freeman, San Francisco, California, and Reading, U.K. Second edition 1972. 509 pp. (£2.60).

■ **The United Nations and the Population Question**, by Richard Symonds and Michael Carder. Chatto and Windus, London, for Sussex University Press, 1973. 236 pp. (£3.00).

■ **A Matter of People**, by Dom Moraes. Praeger, New York and Washington, published in co-operation with the U.N. Fund for Population Activities, 1974. 226 pp.

■ **Population and Labour, the Implications of Rapid Population growth for the Training, Employment and Welfare of Workers**, by Robert Plant. International Labour Office, Geneva, 1973, 163 pp. (Sw.F.17.50).

■ **Water, a Primer**, by Luna B. Leopold. W.H. Freeman, San Francisco, California, and Reading, U.K., 1973, 172 pp. ($4.95, £2.60 cloth; $2.95, £1.50 paper).

■ **Protection of Man's Natural Environment**, by Wladyslaw Szafer. Polish Scientific Publishers, for Polish Academy of Sciences, Warsaw, 1973, 663 p.

■ **World Armaments and Disarmament, SIPRI Yearbook 1974**, Almqvist & Wiksell, Stockholm; MIT Press, Cambridge, Massachusetts, and London, U.K. 1974, 526 pp. (Sw. Kr. 75.00, US $16 approx., £7.50 approx).

■ **The Law-making Functions of the Specialized Agencies of the United Nations**, by Charles Henry Alexandrowicz. Angus & Robertson, Sydney, in association with the Australian Institute of International Affairs, 1973, 181 pp. (A$9.95).

■ **Main Trends in Sociology**, by P.F. Lazarsfield. Harper Torchbooks, New York, San Francisco and London, 1973, a reprint of chapter I of **Main Trends of Research in the Social and Human Sciences**, Moulton/Unesco 1970, 115 pp.

■ **The Social Control of Drugs**, by Philip Bean. Martin Robinson, London, 1974, 198 pp. (£3.95 cloth; £1.95 paper).

■ **To Understand is to Invent, The Future of Education**, by Jean Piaget. Two texts written for Unesco; Grossman,. New York, 1973, 148 pp. ($7.50).

■ **Not Much Time for the Third World**, by Erhard Eppler. First published in Germany, 1971. English edition Oswald Wolff, London, 1972, 143 pp. (£1.00).

■ **The Changing Orient**, edited by Donald McLean. Angus & Robertson, Sydney. 208 pp. (A$6.95 cloth; A$4.95 paper).

René MAHEU
will not stand for re-election as Director-General of Unesco

Mr. René Maheu, Director-General of Unesco, has decided he will not be a candidate for re-election to office after his current six-year term expires on November 14. Elected Director-General of Unesco in 1962, Mr. Maheu was re-appointed to a six-year term of office in October 1968. The next General Conference of Unesco in October-November 1974 will elect a new Director-General.

In a letter dated June 20, Mr. Maheu asked Mr. Fûad Sarrûf (Lebanon), Chairman of the Unesco Executive Board, that his name be removed from the list of candidates submitted by Member States and that members of the Board and all Member States be informed as soon as possible of his decision.

At its next session in September, the Executive Board will propose a candidate to be presented to the General Conference.

Photo Unesco - R. Lesage

UNESCO NEWSROOM

International Fair Play Awards

British soccer star Bobby Charlton and the British cycling team of Ian Hallam, Willie Moore, Mick Bennett and Rick Evans were awarded the 1973 Pierre de Coubertin International Fair Play Trophies at a ceremony at Unesco House on June 7. Bobby Charlton's award was for a career cited as an example of "fair play, modesty and sporting spirit." The cycling team was honoured for declining first place in the finals of the world cycling championships at San Sebastian, Spain, after the Fed. Rep. of Germany team, who were leading, fell because of an error by an official. Diplomas of honour were awarded to British tennis player Roger Taylor and to the Brazilian University basketball team.

Museums in Africa

Museum curators and specialists from 15 English-speaking African countries have urged that greater use be made of travelling exhibitions so as to help museums become part of everyday life in Africa. At a Unesco regional round-table in Lagos, Nigeria, they also recommended more exchanges of museum staff in the same linguistic region.

Drivers' behaviour

In an attempt to explain "the startling differences between accident rates in various countries", the International Driver's Behaviour Research Association has included a study of drivers' opinions and attitudes in its current research programme. Other studies will investigate accident black spots and motorway behaviour. The intensified programme follows last October's international conference on driver behaviour at Zurich, the first of its kind ever held, to which 430 persons, mostly road safety experts, came from 33 countries.

Teaching via satellite

The recent launching of the ATS-F communication satellite from Cape Kennedy (U.S.A.) promises to be a landmark in education. After a year's use in the U.S.A., the satellite will begin instructional television in India. With Unesco's help, the Indian Government has prepared courses on agriculture, health and family life, to reach 5,000 villages. Unesco missions to investigate the use of satellites for education have already visited Africa, Pakistan and the Arab States, and a feasibility study for a regional tele-education system in nine Latin American countries has been completed.

Flashes...

From the latest edition of Unesco's annual *Index Translationum*:

■ *Lenin with 381 translations was the world's most translated author in 1971, followed by the Bible 215, children's writer Enid Blyton 165, Karl Marx 148, crime novelist Agatha Christie 144 and Jules Verne 143.*

■ *The great names in world literature were led by Tolstoy 82, the Grimm brothers 76, Shakespeare 70 and Balzac 68.*

■ *Among authors of philosophical and scientific works, Sigmund Freud led with 47, followed by Jean Piaget 45, Erich Fromm 36, Bertrand Russell 34 and Jean-Paul Sartre 32.*

■ *Total translations, defined as any new foreign language editions appearing during the year, reached 42,970 in 1971, compared with 38,172 in 1970.*

■ *The U.S.S.R., 4,730 titles, beat the combined score of the Fed. Rep. of Germany and the German Dem. Rep. by 81. Other countries publishing more than 3,000 translations were Spain 3,148 and Denmark 3,038.*

A COMPUTER WARNING OF HUNGER TOMORROW

(Continued from page 34)

circumstances no population policy could function any more.

Starvation would not be limited to isolated small areas from which people could escape, but would extend its stranglehold over vast regions inhabited by hundreds of millions. The population would be trapped and there would be no fertile areas to go to as the recent events in semi-arid Africa have so tragically shown. There is no historical precedent for this kind of slow, inexorable destruction of the population of entire regions which at their peak were inhabited by several billion people.

No doubt these events would eventually lead to an equilibrium population, and one might see this as a return to the days before the population explosion took place, i.e. to the times when birth-rate and death-rate were nearly in balance. But, surely, this must not be allowed to happen. Obviously a solution requires a more effective population policy.

Third scenario

In the *third scenario* we have assumed that the equilibrium fertility rates are achieved in 25 to 30 years rather than in 50 years as in the first scenario. Possibly an optimistic assumption, but certainly one that should be achievable.

Even under these more favourable conditions the analysis shows that severe malnutrition cannot be avoided unless food imports are made available, but the required imports are, this time, on a much smaller scale and the really large needs appear at a later date than in previous scenarios, starting in the 1990s rather than the 1980s.

Also, the amount of food which would have to be covered by imports would be reduced to about one fifth of the needs. The volume of the imports, in reference to production, transportation, etc., might then be manageable, but the economic impact of food import would still be devastating. The problem, however, would be reduced to economics.

Fourth scenario

In order to see how this cost-economic obstacle to the solution might be removed, we designed the *fourth scenario* in which we assumed that investment aid is provided to South Asia in sufficient amounts and at the required time to close the food gap. The magnitude of such a programme would require a concerted action by all regions of the "North".

The analysis indicated a substantial increase in the export potential of South Asia. If the world economic situation realizes this great potential, South Asia could pay for the bulk of the necessary food import. The export must be industrial, since the agricultural sector will be occupied with the demands of the region.

This means that South Asia must be allowed to develop its own exportable and competitive industrial specialization which will not be left to the mercy of narrow national interests but rather will rely on long-term world economic arrangements. This, in turn, will require the emergence of a new global economic order in which industrial specialization corresponds to regional capacities, the most effective utilization of labour and capital and of available world resources, on a long-term basis.

To summarize, the only feasible strategy to meet the world food situation calls for:

- a global approach to the problem;
- productive investment and not only commodity aid;
- balanced economic development for all regions;
- a world-wide diversification of industry leading to a truly global and balanced economic system;
- an effective population policy.

This strategy is also the conclusion reached by our model for every other sector of human activity. Omission of any one of these factors will lead to certain disaster.

The situation is urgent. The solution produced by our analysis requires changes which cannot be achieved without compromise among the many parties involved. Even if the will is there, how much time is left for us to argue about the many details of implementation?

The results of our analysis show that achieving the aims of the population policy in 30 rather than 15 years would make a difference of 80 per cent to the number of births. A mere 20 years delay in initiating such a policy would lead to a 300 per cent increase. The inescapable conclusion is that time is indeed short. Delay in implementing the options to bring food supply and need in balance could be fatal. ■

Mihajlo Mesarovic
Eduard Pestel
and Maurice Guernier

'All our estimates are inflated...'

... In our forecasts for 1940-60 we were caught off our guard. We underestimated, not the magnitude of population growth but its acceleration. Some of the experts have now been caught out by the opposite phenomenon, the deceleration of population growth. In point of fact, the decline in birth-rates which we are about to see on a world scale has already set in much more steeply in some cases than was foreseen even on the so-called low fertility assumption. Such cases will be a majority in the future...

All our present estimates are inflated... They were obtained by extrapolation from previous situations which are now changing and in some cases reversing... The rate of deceleration is even more alarming than the previous acceleration... Since 1955 the brakes have been applied sharply in Eastern Europe, since 1957 in the United States and since 1962 in Western Europe. In fact, we are entering a phase of neither acceleration nor deceleration but of demographic stop-go which, one way or another, may well cost us dear...

Nothing could be unhealthier than the obsessive fear of life which has been fanned abroad. Surely, it would be better not to apply the brakes, if we have to step on the accelerator again soon afterwards. Spasmodic population growth is the enemy of harmonious social development and an effective education policy.

Pierre Chaunu

professor of modern history at the University of Paris-Sorbonne

From "Histoire et Prospective" (History and Prospective), published in "Revue Historique", Paris, (July-September 1973)

BOOKSHELF

■ **Population, Resources, Environment, Issues In Human Ecology,** by Paul R. Ehrlich and Anne H. Ehrlich. Freeman, San Francisco, California, and Reading, U.K. Second edition 1972, 509 pp. (£2.60).

■ **The United Nations and the Population Question,** by Richard Symonds and Michael Carder. Chatto and Windus, London, for Sussex University Press, 1973, 236 pp. (£3.00).

■ **A Matter of People,** by Dom Moraes. Praeger, New York and Washington, published in co-operation with the U.N. Fund for Population Activities, 1974, 226 pp.

■ **Population and Labour, the Implications of Rapid Population growth for the Training, Employment and Welfare of Workers,** by Robert Plant. International Labour Office, Geneva, 1973, 163 pp. (Sw.F.17.50).

■ **Water, a Primer,** by Luna B. Leopold. W.H. Freeman, San Francisco, California, and Reading, U.K., 1973, 172 pp. ($4.95, £2.60 cloth; $2.95, £1.50 paper).

■ **Protection of Man's Natural Environment,** by Wladyslaw Szafer. Polish Scientific Publishers, for Polish Academy of Sciences, Warsaw, 1973, 663 p.

■ **World Armaments and Disarmament, SIPRI Yearbook 1974,** Almqvist & Wiksell, Stockholm; MIT Press, Cambridge, Massachusetts, and London, U.K. 1974, 526 pp. (Sw. Kr. 75.00, US $16 approx., £7.50 approx).

■ **The Law-making Functions of the Specialized Agencies of the United Nations,** by Charles Henry Alexandrowicz. Angus & Robertson, Sydney, in association with the Australian Institute of International Affairs, 1973, 181 pp. (A$9.95).

■ **Main Trends in Sociology,** by P.F. Lazarsfield. Harper Torchbooks, New York, San Francisco and London, 1973, a reprint of chapter I of **Main Trends of Research in the Social and Human Sciences,** Moulton/Unesco 1970, 115 pp.

■ **The Social Control of Drugs,** by Philip Bean. Martin Robinson, London, 1974, 198 pp. (£3.95 cloth; £1.95 paper).

■ **To Understand is to Invent, The Future of Education,** by Jean Piaget. Two texts written for Unesco; Grossman,, New York, 1973, 148 pp. ($7.50).

■ **Not Much Time for the Third World,** by Erhard Eppler. First published in Germany, 1971. English edition Oswald Wolff, London, 1972, 143 pp. (£1.00).

■ **The Changing Orient,** edited by Donald McLean. Angus & Robertson, Sydney, 208 pp. (A$6.95 cloth; A$4.95 paper).

René MAHEU
will not stand for re-election as Director-General of Unesco

Mr. René Maheu, Director-General of Unesco, has decided he will not be a candidate for re-election to office after his current six-year term expires on November 14. Elected Director-General of Unesco in 1962, Mr. Maheu was re-appointed to a six-year term of office in October 1968. The next General Conference of Unesco in October-November 1974 will elect a new Director-General.

In a letter dated June 20, Mr. Maheu asked Mr. Fûad Sarrûf (Lebanon), Chairman of the Unesco Executive Board, that his name be removed from the list of candidates submitted by Member States and that members of the Board and all Member States be informed as soon as possible of his decision.

At its next session in September, the Executive Board will propose a candidate to be presented to the General Conference.

Photo Unesco - R. Lesage

UNESCO NEWSROOM

International Fair Play Awards

British soccer star Bobby Charlton and the British cycling team of Ian Hallam, Willie Moore, Mick Bennett and Rick Evans were awarded the 1973 Pierre de Coubertin International Fair Play Trophies at a ceremony at Unesco House on June 7. Bobby Charlton's award was for a career cited as an example of "fair play, modesty and sporting spirit." The cycling team was honoured for declining first place in the finals of the world cycling championships at San Sebastian, Spain, after the Fed. Rep. of Germany team, who were leading, fell because of an error by an official. Diplomas of honour were awarded to British tennis player Roger Taylor and to the Brazilian University basketball team.

Museums in Africa

Museum curators and specialists from 15 English-speaking African countries have urged that greater use be made of travelling exhibitions so as to help museums become part of everyday life in Africa. At a Unesco regional round-table in Lagos, Nigeria, they also recommended more exchanges of museum staff in the same linguistic region.

Drivers' behaviour

In an attempt to explain "the startling differences between accident rates in various countries", the International Driver's Behaviour Research Association has included a study of drivers' opinions and attitudes in its current research programme. Other studies will investigate accident black spots and motorway behaviour. The intensified programme follows last October's international conference on driver behaviour at Zurich, the first of its kind ever held, to which 430 persons, mostly road safety experts, came from 33 countries.

Teaching via satellite

The recent launching of the ATS-F communication satellite from Cape Kennedy (U.S.A.) promises to be a landmark in education. After a year's use in the U.S.A., the satellite will begin instructional television in India. With Unesco's help, the Indian Government has prepared courses on agriculture, health and family life, to reach 5,000 villages. Unesco missions to investigate the use of satellites for education have already visited Africa, Pakistan and the Arab States, and a feasibility study for a regional tele-education system in nine Latin American countries has been completed.

Flashes...

From the latest edition of Unesco's annual *Index Translationum*:

■ *Lenin with 381 translations was the world's most translated author in 1971, followed by the Bible 215, children's writer Enid Blyton 165, Karl Marx 148, crime novelist Agatha Christie 144 and Jules Verne 143.*

■ *The great names in world literature were led by Tolstoy 82, the Grimm brothers 76, Shakespeare 70 and Balzac 68.*

■ *Among authors of philosophical and scientific works, Sigmund Freud led with 47, followed by Jean Piaget 45, Erich Fromm 36, Bertrand Russell 34 and Jean-Paul Sartre 32.*

■ *Total translations, defined as any new foreign language editions appearing during the year, reached 42,970 in 1971, compared with 38,172 in 1970.*

■ *The U.S.S.R., 4,730 titles, beat the combined score of the Fed. Rep. of Germany and the German Dem. Rep. by 81. Other countries publishing more than 3,000 translations were Spain 3,148 and Denmark 3,038.*

Letters to the Editor

THE REAL STUMBLING BLOCK

Sir,

I wish to congratulate you on your May 1974 issue on population, and particularly on the clarity of the visual presentation. I read with interest the opposing articles by Frank Notestein and Julian Simon on the relation between birth-rate and economic development. In point of fact, they are probably both right, for the world provides many examples of developing countries where the Notestein thesis clearly seems to be correct, while one could also point to examples of industrialized countries and some potentially rich but sparsely populated countries where Simon's point of view is apparently justified.

But what surprises me is that each of these two writers declares that the problem of demographic growth in the world is not connected to that of available natural resources. They are extraordinarily casual about this matter and seem to take refuge in a blind faith in the omnipotence of technology.

If it is true that "the world has never been so close to being able to obtain a supply of basic resources beyond the imaginings of all previous generations" (Notestein), or that "we now have available to us vastly more resources of almost every kind than did people in any previous age" (Simon), it is unfortunately quite as true that the rate of growth of these resources has great difficulty in keeping up with the combination of demographic growth and the higher living standards demanded by more and more people.

This struggle is particularly dramatic in the case of food, and if Notestein is right to point out that "The less developed nations of dense settlement need to triple their food supply by the end of the century", he does not seem to be aware of the effort this will require, even if they manage to achieve it. In the same way, his comments on "an almost unlimited supply of cheap energy" are to say the least surprising, at a time when the price of oil has quadrupled and the future of energy, especially nuclear energy, raises innumerable questions.

I believe, on the contrary, that the limitation of natural resources on a limited planet, and certainly the difficulties and delays inherent in their ever-increasing consumption, especially as far as food is concerned, are one of the essential factors to consider in what is usually called the world population problem.

Michel Batisse
Director, Department of Environmental Sciences and Natural Resources Research, Unesco

Sir,

Congratulations on your May 1974 issue giving us a world picture of the population situation. The presentation—as always—was excellent, and I admire your courage in looking hard facts in the face.

Prof. Pierre Auger
Paris

THE ICELAND SAGA

Sir,

I have been a reader and admirer of the "Unesco Courier" since 1969. Your February 1974 issue, "The Iceland Saga", is wonderful. You have given a very clear, brief idea of Iceland along with some breathtaking photographs.

R. Kalyan
New Delhi

ONUFRI... A DISCOVERY IN ART

Sir,

Bravo for your April 1974 issue on archaeology and art, and particularly for the article on Onufri, the great 16th-century Albanian painter of fantasy and realism. Until now his work has been virtually unknown, in spite of its great significance in the development of post-Byzantine art.

His painting of the Baptism of Christ is a rich composition, and the face of God the Father, looking down from a luminous schematic cloud above, clearly shows the influence of Western art.

Unfortunately, this great painter is unknown in our country and does not figure in handbooks of Christian and Byzantine archaeology.

Costas Charalarupidis
Thessalonica, Greece

MANDRAKE THE MAGICIAN...

Sir,

I read the June 1974 issue of the "Unesco Courier" with great interest. Among the pictures illustrating the article by Hakim Mohammed Said are two on page 37 depicting the mandrake, a plant about which I have written a short study. (In "Annales de la Société d'Horticulture et d'Histoire Naturelle de l'Hérault", n°s 3-4, 1966).

There can be no doubt that the Muslim doctors shown in the miniature are examining a genuine mandrake, recognizable by its forked root, its corona of leaves and its flowered stems. On the other hand, the large photo on the left of the page represents an imitation mandrake of the type mentioned in the caption. It is a root or a piece of wood which has been carved in human form.

Dr. D. Jarry
Faculty of Medicine
Montpellier, France

The object in the picture we published is from the collection of Monsieur Roger Caillois, who has sent us the following reply.—Ed.

Dr. Jarry casts doubt, not on the authenticity of the object shown, but on its botanical species, and with reason.

I accept Dr. Jarry's comments as perfectly accurate, though they hardly needed making. The root I possess is not necessarily a root of the botanical species *mandrake*, but a magical "mandrake" named after the much sought-after medicinal plant. Its extreme rarity caused countless imitations to be made by retouching suitable roots in such a way as to give them a human appearance. It is quite possible that mandrakes used for magical purposes were never made from the real thing, in the botanical sense. This is made clear in Dr. Jarry's scholarly study. It is more than likely indeed that sorcerers and charlatans did not even bother to look for this extremely rare plant, but instead used roots which looked somewhat similar.

My specimen comes from the Millau region (France). It was found near a petrifying fountain, which explains its preservation. It is an "authentic fake", so to speak. From the strict botanical point of view, almost all "mandrakes" are such fakes.

CELTIC HERITAGE

Sir,

Laurent David, of France, (Letters to the Editor, May 1974) calls attention to Celtic Civilization. We have received something of this heritage, as descendants of the Celts here in Wales.

Celtic remains here are not plentiful, but though the visual arts suffered, the art of the poet took pride of place from the sixth century onwards.

It is often said that there were no "Dark Ages" in Wales and Ireland. Was this because of the uplifting effect of Celtic Civilization as well as that of the Romans?

Owen T. Griffith
Anglesey, Wales

ECUADOR'S ANCIENT POTTERY

I was especially interested in Jorge Adoum's article on Ecuadorian pottery (April 1974 issue).

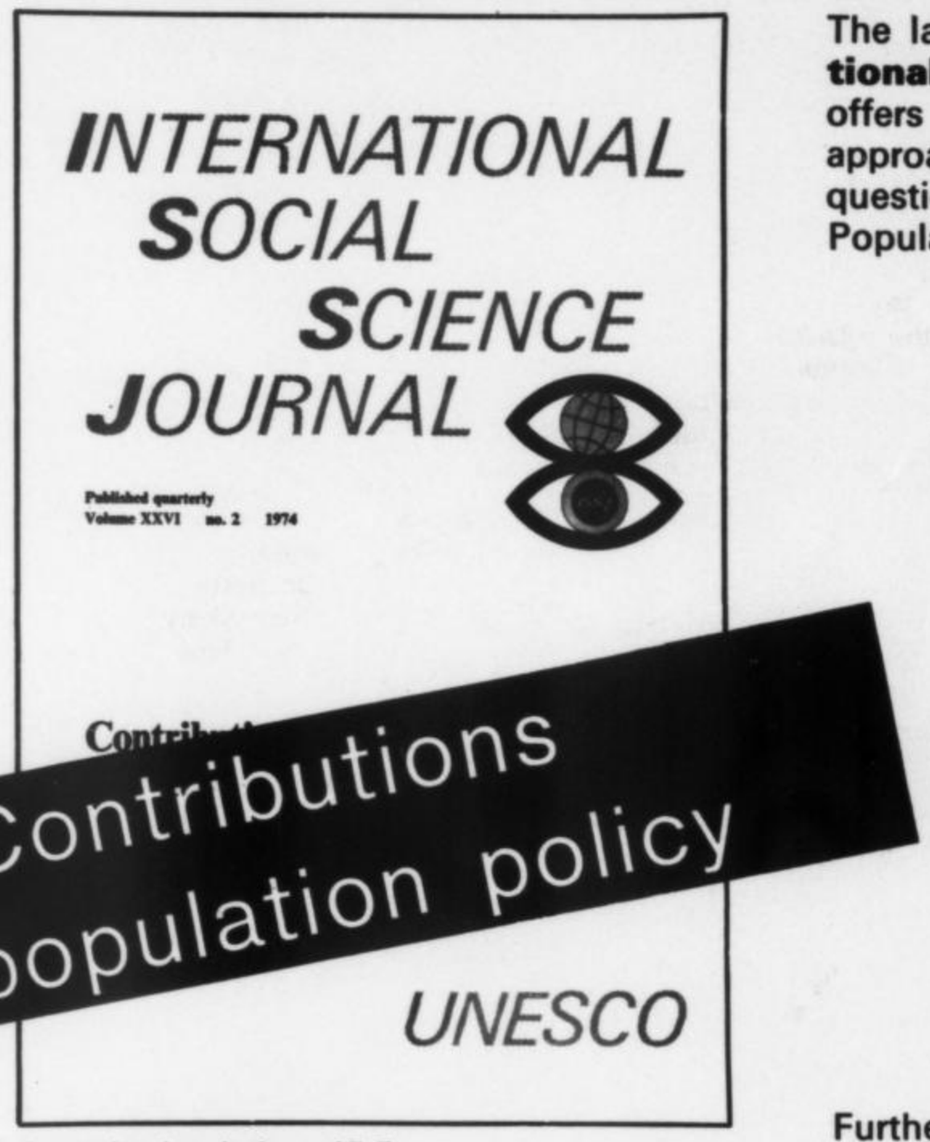
I have long been familiar with the book, "Travels among the Great Andes of the Equator", written by the English mountaineer Edward Whymper towards the end of the 19th century, and recounting his work in Ecuador in 1879 and 1880. Whymper had a good deal to say about Ecuadorian antiquities, including dressed rocks found on Corazon, and La Condamine's pyramids of Quito, but he also had a long chapter on stone objects. These included what he called "Stars in Stone", stone implements, and household gods. This is in chapter XIV of the book, where he also discusses old Indian pottery, musical whistles, and vase busts. My edition, published by John Murray, London, 1892, contains numerous illustrations.

I think many English readers of the "Unesco Courier" may want to get "Travels Among the Great Andes" out of the library.

Hector Munro
Birkenhead, U.K.

Imp. GEORGES LANG, PARIS. — Dépôt légal C 1 — Juillet 1974 — IMPRIMÉ EN FRANCE (Printed in France)

Just published



The latest issue of Unesco's quarterly **International Social Science Journal** (N° 2 - 1974) offers a very wide conspectus of scholarly approaches to many aspects of the population question which are being discussed in World Population Year 1974.

Milos Maçura **(Yugoslavia) traces the evolution of attitudes to population questions in the forums of the United Nations system.**

Brian Johnson **(U.K.) analyzes the impact of population growth on the environment.**

W. Ahmed **(Pakistan) puts the question: "How can one expect planned parenthood to function in a largely unplanned world?"**

Two Soviet demographers, *V.S. Steshenko* and *V.P. Piskunov,* evaluate the effects of ageing in populations and *H.J. Heeren* (Netherlands) considers the problems accompanying declining population growth.

Further articles deal with population change and education, attitudes towards abortion, shifting economic structures and employment in India, the economics of decision-making about family size, and population education.

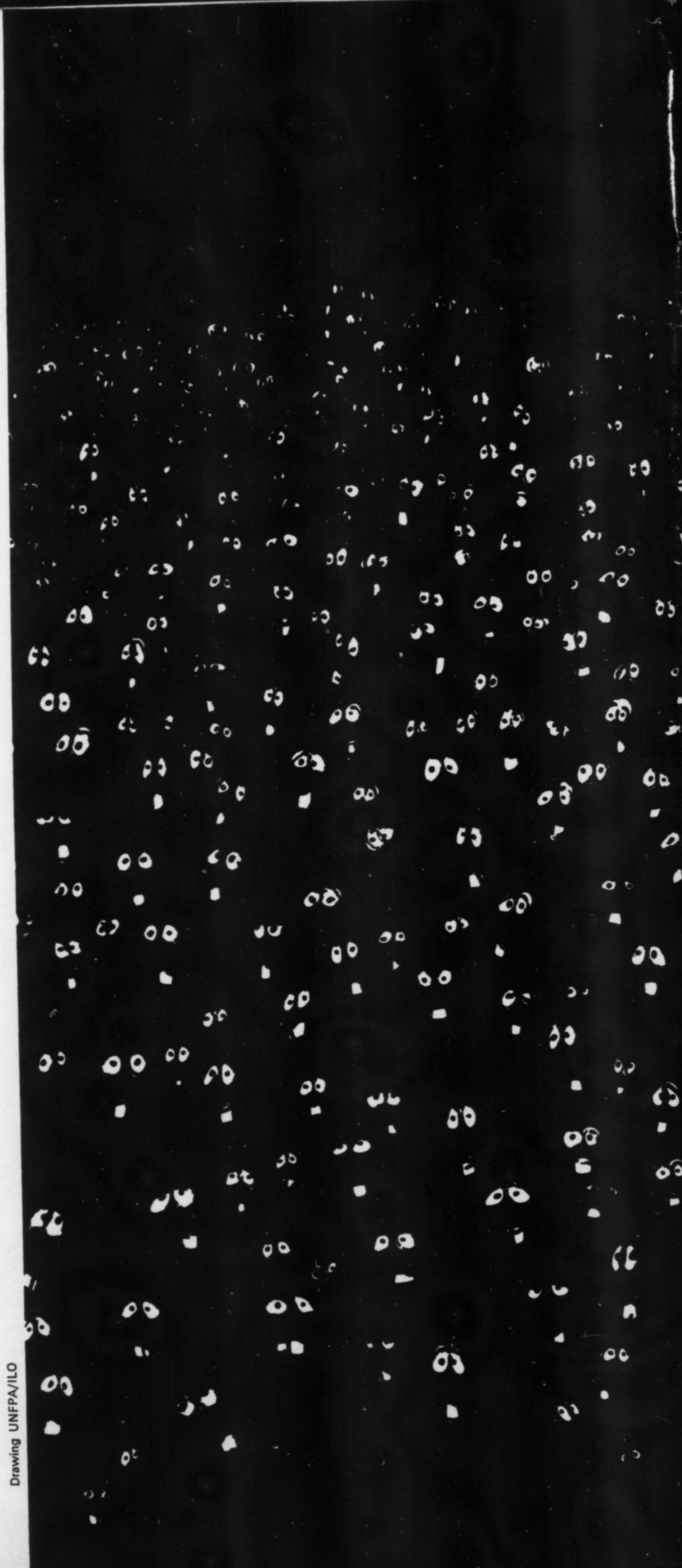
Annual subscription: 45 F
Single copy: 14 F

Order directly from the Trade Services of The Unesco Press, Place de Fontenoy, 75700 Paris, or Unesco National Distributors listed below

Where to renew your subscription
and order other Unesco publications

Order from any bookseller or write direct to the National Distributor in your country. (See list below; names of distributors in countries not listed, along with subscription rates in local currency, will be supplied on request.)

— **AUSTRALIA.** Publications : Educational Supplies Pty. Ltd., P.O. Box 33, Brookvale, 2100, NSW; Periodicals: Dominie Pty. Limited, Box 33, Post Office, Brookvale 2100, NSW. Sub-agent: United Nations Association of Australia, Victorian Division 5th floor, 134/136 Flinders St., Melbourne (Victoria), 3000. — **AUSTRIA.** Verlag Georg Fromme & C°., Arbeitergasse 1-7, 1051, Vienna.—**BELGIUM.** "Unesco Courier" Dutch edition only: N.V. Handelmaatschappij Keesing, Keesinglaan 2-18, 2100 Deurne-Antwerpen. French edition and general Unesco publications agent: Jean de Lannoy, 112, rue du Trône, Brussels 5. CCP 3380.00. — **BURMA.** Trade Corporation N° (9), 550-552 Merchant Street, Rangoon. — **CANADA.** Information Canada, Ottawa, (Ont.). — **CYPRUS,** MAM", Archbishop Makarios 3rd Avenue, P. O. Box 1722, Nicosia. — **CEZCHOSLOVAKIA.** S.N.T.L., Spalena 51, Prague 1 (permnent display); Zahranicni literatura, 11 Soukenicka Prague 1. For Slovakia only : Alfa Verlag - Publishers, Hurbanovo nam. 6, 893 31 Bratislava - CSSR. — **DENMARK.** Munksgaards Boghandel, 6, Nörregade, DK-1165, Copenhagen K. — **EGYPT (ARAB REPUBLIC OF).** National Centre for Unesco Publications, N° 1 Talaat Harb Street, Tahrir Square, Cairo; Librairie Kasr El Nil, 38, rue Kasr El Nil, Cairo. — **ETHIOPIA.** National Commission for Unesco, P.O. Box 2996, Addis Ababa. — **FINLAND,** Akateeminen Kirjakauppa, 2 Keskuskatu, Helsinki. — **FRANCE.** Librairie de l'Unesco, 7-9, place de Fontenoy, 75700-Paris, C.C.P. 12598-48. — **GERMAN DEMOCRATIC REP.** Deutscher Buch-Export und Import Gmbh, Leninstrasse 16, 701 Leipzig. — **FED. REP. OF GERMANY** For the Unesco Kurier (German ed. only): Bahrenfelder-Chaussee 160, Hamburg-Bahrenfeld, C.C.P. 276650. For scientific maps only: GEO CENTER D7 Stuttgart 80, Postfach 800830. Other publications: Verlag Dokumentation, Postfach 148, Jaiserstrasse 13, 8023 Munchen-Pullach. — **GHANA.** Presbyterian Bookshop Depot Ltd., P.O. Box 195, Accra; Ghana Book Suppliers Ltd., P.O. Box 7869, Accra; The University Bookshop of Ghana, Accra; The University Bookshop of Cape Coast, The University Bookshop of Legon, P.O. Box 1, Legon. — **GREAT BRITAIN.** See United Kingdom. — **GREECE.** Anglo-Hellenic Agency, 5, Koumpari Street Athens 138; — **HONG-KONG.** Swindon Book Co., 13-15, Lock Road, Kowloon. — **HUNGARY.** Akadémiai Könyvesbolt, Váci u. 22, Budapest V; A.K.V. Könyvtarosok Boltja, Népköztársaság utja 16, Budapest VI. — **ICELAND.** Snaebjörn Jonsson & Co., H.F., Hafnarstraeti 9, Reykjavik. — **INDIA.** Orient Longman Ltd., Nicol Road, Ballard Estate, Bombay 1; 17 Chittaranjan Avenue, Calcutta 13; 36a, Anna Salai, Mount Road, Madras 2; B-3/7 Asaf Ali Road, New Delhi 1; Sub-Depots: Oxford Book & Stationery Co. 17 Park Street, Calcutta 16; and Scindia House, New Delhi; Publications Section, Ministry of Education and Social Welfare, 72 Theatre Communication Building, Connaught Place, New Delhi 1. — **INDONESIA.** Indira P.T., Jl. Dr. Sam Ratulangie 37, Jakarta. — **IRAN.** Kharazmie Publishing and Distribution C°., 229 Daneshgahe Street, Shah Avenue, P.O. Box 14-1486, Teheran. Iranian National Commission for Unesco, Avenue Iranchahr Chomali No 300, B.P. 1533, Teheran. — **IRAQ.** McKenzie's Bookshop, Al-Rashid Street, Baghdad; University Bookstore, University of Baghdad, P.O. Box 75, Baghdad. — **IRELAND.** The Educational Company of Ireland Ltd., Ballymount Road, Walkinstown, Dublin 12. **ISRAEL.** Emanuel Brown, formerly Blumstein's Bookstores, 35 Allenby Road and 48, Nachlat Benjamin Street, Tel-Aviv; 9, Shlomzion Hamalka Street Jerusalem. — **JAMAICA.** Sangster's Book Stores Ltd., P.O. Box 366, 101 Water Lane, Kingston. — **JAPAN.** Maruzen Co. Ltd., P.O. Box 5050, Tokyo International 100-31. — **KENYA.** The E.S.A. Ltd., P.O. Box 30167, Nairobi. — **KOREA.** Korean National Commission for Unesco, P.O. Box Central 64, Seoul. — **KUWAIT.** The Kuwait Bookshop Co., Ltd., P.O. Box 2942, Kuwait. — **LIBERIA.** Cole and Yancy Bookshops Ltd., P.O. Box 286, Monrovia. — **LIBYA.** Agency for Development of Publication & Distribution, P.O. Box 34-35, Tripoli. — **LUXEMBOURG.** Librairie Paul Bruck, 22, Grand-Rue, Luxembourg. — **MALAYSIA.** Federal Publications Sdn. Bhd., Balai Berita, 31, Jalan Riong, Kuala Lumpur. — **MALTA.** Sapienza's Library, 26 Kingsway, Valletta. — **MAURITIUS.** Nalanda Company Ltd., 30, Bourbon Street, Port-Louis. — **MONACO.** British Library, 30, Bld des Moulins, Monte-Carlo. — **NETHERLANDS.** For the " Unesco Koerier " Dutch edition only : Systemen Keesing, Ruysdaelstraat 71-75, Amsterdam-1007. Agent for all Unesco publications : N. V. Martinus Nijhoff, Lange Voorhout, 9, The Hague. — **NETHERLANDS ANTILLES.** G. C. T. Van Dorp & Co. (Ned Ant.). N.V., Willemstad, Curaçao. N. A. — **NEW ZEALAND.** Government Printing Office, Government Bookshops at : Rutland Street, P.O. Box 5344, Auckland; 130, Oxford Terrace, P.O. Box 1721, Christchurch; Alma Street, P.O. Box 857 Hamilton; Princes Street, P.O. Box 1104, Dunedin; Mulgrave Street, Private Bag, Wellington. — **NIGERIA** The University Bookshop of Ife, The University Bookshop of Ibadan, P.O. Box 286; The University Bookshop of Nsukka; The University Bookshop of Lagos; The Ahmadu Bello University Bookshop of Zaria. — **NORWAY.** All publications : Johan Grundt Tanum (Booksellers) Karl Johans gate 41/43, Oslo 1. For Unesco Courier only: A.S. Narvesens Litteraturtjeneste, Box 6125, Oslo 6. — **PAKISTAN.** The West-Pak Publishing Co. Ltd., Unesco Publications House, P.O. Box 374 G.P.O., Lahore; Showrooms: Urdu Bazaar, Lahore, and 57-58 Murree Highway, G/6-1, Islamabad. Pakistan Publications Bookshop, Sarwar Road, Rawalpindi. Mirza Book Agency 65 Shahrah Quaid-e-azam, P.O. Box N° 729, Lahore-3 — **PHILIPPINES.** The Modern Book Co., 926 Rizal Avenue, P.O. Box 632, Manila D-404. — **POLAND.** All publications : ORWN PAN Palac Kultury i Nauki, Warsaw. For the Unesco Courier only : RUCH, ul. Wronia, 23, Warsaw 10. — **PORTUGAL.** Dias & Andrade Ltda, Livraria Portugal, rua do Carmo 70, Lisbon. — **SINGAPORE.** Federal Publications Sdn Bhd., Times House, River Valley Road, Singapore 9. — **SOUTHERN RHODESIA.** Textbook Sales (PVT) Ltd., 67 Union Avenue, Salisbury. — **SRI LANKA.** Lake House Bookshop, 100 Sir Chittampalam Gardiner Mawata P.O.B. 244 Colombo 2. — **SUDAN.** Al Bashir Bookshop, P.O. Box 1118, Khartoum. — **SWEDEN.** All publications: A/B C.E. Fritzes Kungl. Hovbokhandel, Fredsgatan 2, Box 16356, 10327 Stockholm 16. For the Unesco Courier: Svenska FN-Förbundet, Skolgränd 2, Box 150 50 S- 104 65, Stockholm. — **SWITZERLAND.** All publications : Europa Verlag, 5 Ramistrasse, Zurich. Librairie Payot, rue Grenus 6, 1211, Geneva 11, C.C.P. 12-236. — **TANZANIA.** Dar-es-Salaam Bookshop, P.O.B. 9030 Dar-es-Salaam. — **THAILAND.** Suksapan Panit, Mansion 9, Rajdamnern Avenue, Bangkok. — **TURKEY.** Librairie Hachette, 469 Istiklal Caddesi, Beyoglu, Istanbul. — **UGANDA.** Uganda Bookshop, P.O. Box 145, Kampala. — **SOUTH AFRICA.** All publications: Van Schaik's Bookstore (Pty). Ltd., Libri Building, Church Street, P.O. Box 724, Pretoria. For the Unesco Courier (single copies) only: Central News Agency P.O. Box 1033, Johannesburg. **UNITED KINGDOM.** H.M. Stationery Office, P.O. Box 569, London, S.E.I., and Government Bookshops in London, Edinburgh, Cardiff, Belfast, Manchester, Birmingham, Bristol. — **UNITED STATES.** Unesco Publications Center, P.O. Box 433, New York, N.Y. 10016. — **U.S.S.R.** Mezhdunarodnaja Kniga, Moscow, G-200. — **YUGOSLAVIA.** Jugoslovensita Knjiga, Terazije, 27, Belgrade; Drzavna Zalozba Slovenije Mestni Trg. 26, Ljubljana.



6,000,000 MORE EVERY MONTH

"And tomorrow how many?" asked the "Unesco Courier" on the cover of its May 1974 issue, devoted to the world demographic situation. The world's population is in fact growing by more than six million a month. Six million more persons to feed, educate, house and clothe: six million more with a right to medical care, social security and satisfying employment. Cover drawing is one of a series of posters published by the International Labour Organization to mark World Population Year. Others are reproduced in centre colour pages (see page 34).

Drawing UNFPA/ILO